AUG 24 1910

JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second-class matter [illegible] 1906, at the Post Office at San Francisco, Cal., under the Act of Congress March 3, 1879

VOL. XXV No. 8 | SAN FRANCISCO, AUGUST 20, 1910 | PER COPY, 10 CENTS

Henshaw, Bulkley & Co.

ENGINEERS

Machinery Merchants

San Francisco: 19 - 21 Fremont Street
Los Angeles: 262 So. Los Angeles St.
Oakland: 1436 Fifth St.

OKONITE WIRE

OKONITE
TRADE MARK
REG. U.S PATENT OFFICE.

The STANDARD for RUBBER INSULATION

Okonite Tape, Manson Tape,
Candee Weatherproof Wire,
Candee (Patented) Potheads.

The Okonite Company

253 BROADWAY, NEW YORK

CENTRAL ELECTRIC CO., Chicago, Ill. F. D. LAWRENCE ELECTRIC CO., Cincinnati, O.
NOVELTY ELECTRIC CO., Philadelphia, Pa. PETTINGELL-ANDREWS CO., Boston, Mass.
ROBBINS ELECTRIC CO., Pittsburg, Pa.

PARANITE

INDIANA RUBBER AND INSULATED WIRE CO.

Manufacturers of Paranite and Peerless Rubber Covered Wires and Cables
Underground Aerial, Submarine and Inside Use
Telephone, Telegraph and Fire Alarm Cables
All Wires are Tested at Factory JONESBORO, IND.

Electric Appliance Company

728 Mission St., San Francisco — Pacific Coast Agents

Standard Underground Cable Co.

MANUFACTURERS OF

COPPER WIRES, CABLES AND ACCESSORIES

FOR ALL SERVICES

PACIFIC COAST DEPT. First National Bank Building, San Francisco
Sub-Office—Los Angeles, Cal.
GENERAL OFFICES: PITTSBURG, PA.
Factories Oakland, Cal., Pittsburg, Pa., Perth Amboy, N. J.
Branch Offices: New York, Boston, Chicago, Philadelphia, St. Louis

Phillips Insulated Wire Co.

PAWTUCKET, R. I.

INSULATED WIRE TRADE MARK "O.K." AND CABLES

"O.K." WEATHERPROOF
"PARAC" RUBBER COVERED

BLACK CORE TRADE PARAC RUBBER WIRES

COMPLETE STOCKS CARRIED BY
OUR PACIFIC COAST AGENTS

California Electric Co. LOS ANGELES — Electric Appliance Co. SAN FRANCISCO — Western Electric Co. SEATTLE

Specify....

BROOKFIELD
GLASS INSULATORS

The Standard

PACIFIC METER CO.

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

311 SANTA MARINA BUILDING
California and Drumm Sts. — San Francisco

VULCAN ..... Refrigerating and Ice Making Machinery

MANUFACTURED BY

VULCAN IRON WORKS

Office: 702 Atlas Bldg., 604 Mission St.
Works: Francisco and Kearny Streets — San Francisco

FOR INDEX TO ADVERTISEMENTS SEE PAGE EIGHT

SIMPLEX

SPECIAL CONDITIONS Met by SPECIAL DESIGN Prompt Attention

INSULATED WIRES and CABLES RUBBER — CAMBRIC THE SIMPLEX ELECTRICAL CO - BOSTON

ALL TYPES RUBBER INSULATED

WIRES and CABLES

Telephone-Electric Equipment Company

Pacific Coast Sales Agents

612 HOWARD STREET SAN FRANCISCO

SEATTLE LOS ANGELES

SIMPLEX

For Suburban Underground Connections Use Steel Taped Lead Covered Cables No Conduit—Quickly Installed Few Joints

INSULATED WIRES and CABLES RUBBER — CAMBRIC THE SIMPLEX ELECTRICAL CO - BOSTON

BLAKE

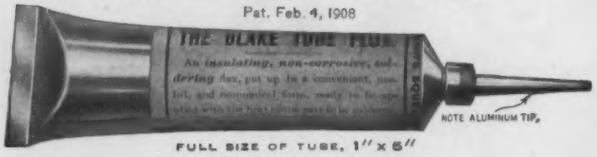
Insulated Staples

Unequalled for telephone and bell wiring. The fibre insulation prevents troublesome short circuits and grounds. The square shoulder gives good driving qualities. Less staples required. Saves in material and labor and gives a more finished job.

Write for samples.

Blake Soldering Flux

Pat. Feb. 4, 1908



FULL SIZE OF TUBE, 1" x 5"

An insulating, non-corrosive soldering flux in the most convenient form.

BROOKS-FOLLIS ELECTRIC CORP., San Francisco

WESTERN ELECTRIC CO., San Francisco

BLAKE SIGNAL & MFG. CO., Boston

MANUFACTURERS

THE RIGHT WAY TO DO IT IS WITH

CONDULETS

"They Make The Job"

WE CARRY A FULL LINE IN EACH OF OUR HOUSES

Pacific States Electric Company

The Modern Electrical Supply House

PORTLAND SAN FRANCISCO

OAKLAND LOS ANGELES

WRITE OUR NEAREST HOUSE

B 213520

JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXV SAN FRANCISCO, AUGUST 20, 1910. NUMBER 8

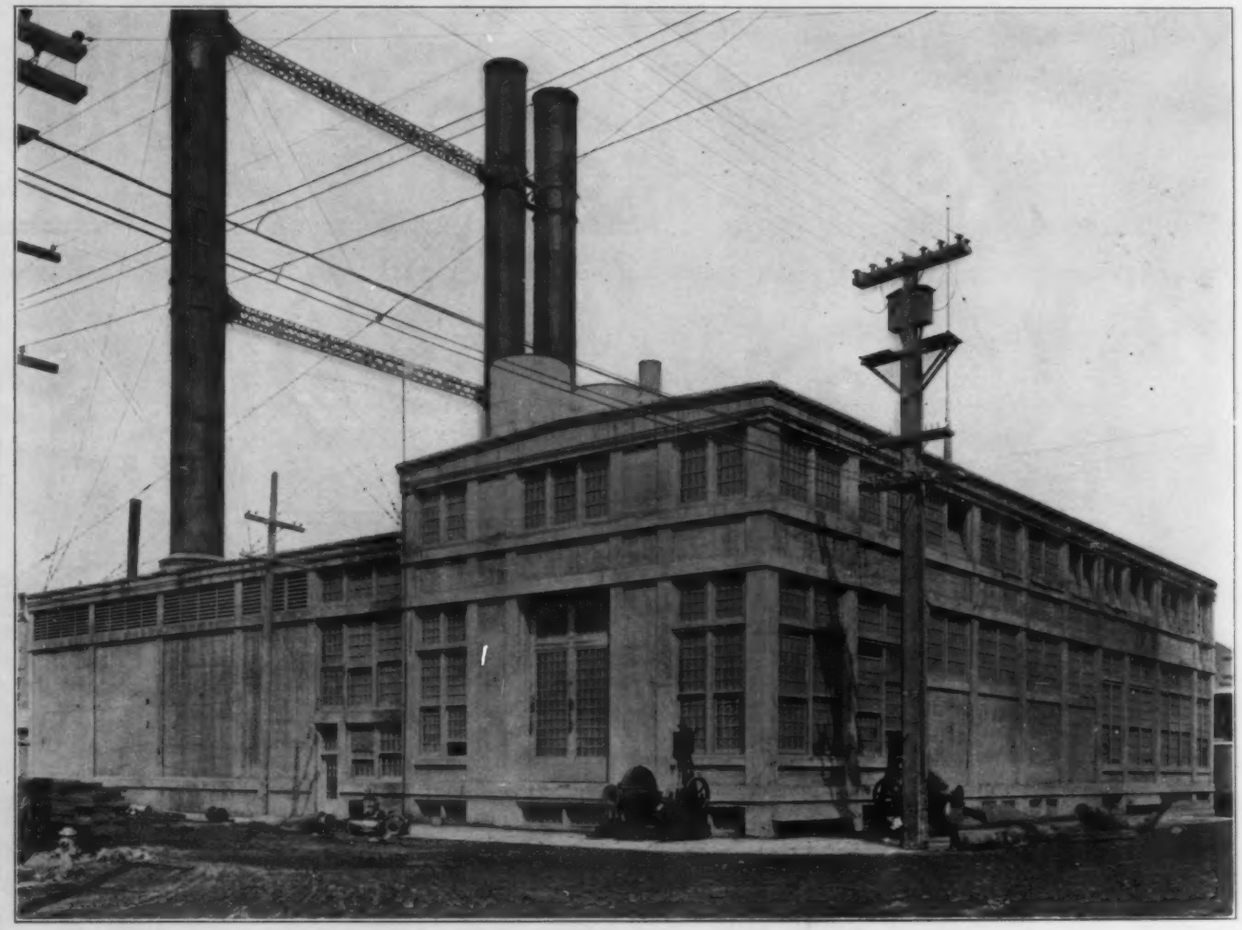
[Copyright 1910, by Technical Publishing Company]

POWER SYSTEM OF THE CITY ELECTRIC COMPANY

BY J. G. DE REMER AND CHAS. W. BAKER

The steam power plant of the City Electric Company of San Francisco stands as a concrete example on the affirmative side of the argument on steam versus hydraulic power in California. Coming into existence, as it did, shortly after the great conflagration of 1906, this company has grown up with the new city, until it possesses at the present time a generating station and distribution system of the most modern type, now being the largest on the Pacific Coast. Furthermore, the generating station is an excellent illustration of the remarkable development of the modern steam turbo-generator, the entire station being equipped with this type of machine.

The power house is at the corner of Beach and Mason streets, San Francisco, immediately adjacent to the bay where the Golden Gate guards the entrance to San Francisco.



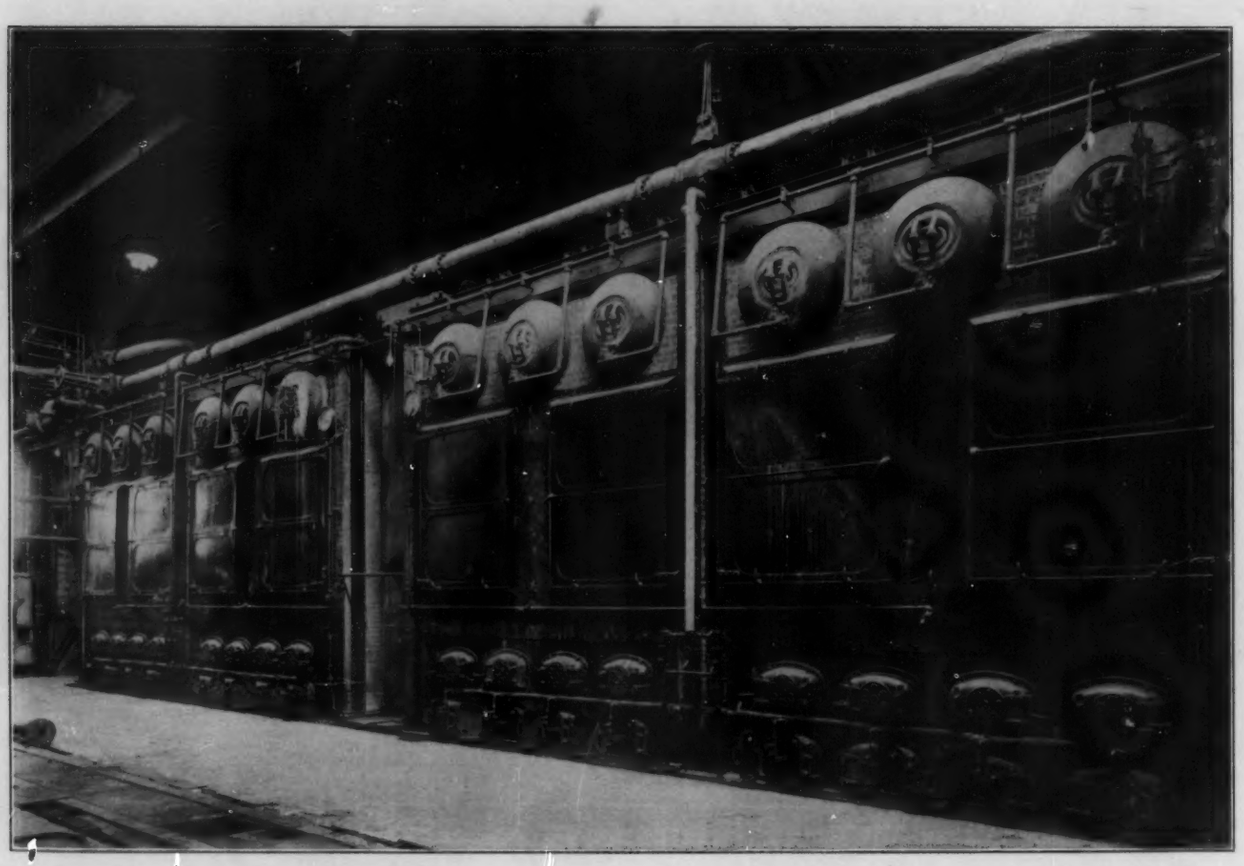
Power House of the City Electric Company, San Francisco

The building is constructed of reinforced concrete, is 137½ ft. square and approximately 40 ft. high. The turbo-generator room is 46 ft. by 137½ ft.

Within this space has been concentrated 30,000 kw. of steam-electric generating capacity, in addition to the controlling switchboard and circuit breaker equipment, as well as the exciter. This represents an average of .21 sq. ft. of floor space per kw. Where a power plant stands on valuable city property, as in this instance, this feature of compactness is a most desirable one, and in this respect the steam turbo-generator excels all other types of power generators.

Boiler Room.

The boiler room is equipped throughout with Babcock and Wilcox water tube boilers. The original installation was made up in batteries 21 rows wide and 14 rows high, while the later installation is made up in batteries 24 rows wide and 14 rows high. The accompanying photograph shows the arrangement of the boilers and the ample space which is available for operation, repair work, and general cleaning. Each boiler is equipped with a Babcock and a Wilcox superheater giving from 50 to 60 degrees superheat, the principal purpose being to ensure dry steam for operating the turbines, rather than to obtain a higher efficiency due to a greater temperature range as is usually desired when superheating is adopted.



Boiler Room

Fuel Supply.

The fuel is supplied through pipes leading direct from two storage tanks. These tanks are situated, one 500 ft. away and the other one 1000 ft. away from the power house, one being about 50 ft. higher than the boiler room floor and the other approximately on the same level as the floor. The fuel tank nearer the power house has a capacity of 10,000 bbls., while the other has a capacity of 30,000 bbl., 42 gals. per bbl. The fuel is delivered to these tanks directly from oil floats or vessels, being pumped into the tanks by the vessel pump. An 8-in. buried pipe conveys the fuel from these tanks to the street line of the power house, where it is reduced to a 6-in. pipe, which conveys it directly to the fuel pumps. This latter pipe is steam-jacketed, exhaust steam from the fuel pumps thus heating the oil before it reaches the fuel pump. After going through the fuel pump the fuel is heated in a special heater which was built by the City Electric Company. This heater consists of a steam tank through which passes a coil carrying the oil. This causes but slight back pressure upon the exhaust of the auxiliary, and is considered one of the unique features of the plant. There are two of these heaters, having an area of approximately 300 sq. ft. each. After passing through these heaters the oil goes through a separator, made by the City Electric Company, and consisting of an 8-in. pipe approximately 16 ft. long, inside of which are fitted baffle plates. The oil then goes directly to the burners under a pressure of about 60 lb. per sq. in.

The amount of fuel admitted to the burners is controlled by a Witt diaphragm regulator on the throttle valve of the fuel pump. This regulator will vary the pressure approximately 20 lb. per sq. in. It is controlled by the variation in boiler steam pressure. Since such a large variation in oil pressure is controlled by the regulator, but one fireman is necessary to attend to the whole battery of boilers, his attention only being necessary when the pressure limits exceed the above

mentioned variation. The oil on reaching the burners is at a temperature between 160 and 180 degrees F. The burners are of the Leahy type made by the Leahy Manufacturing Company, of Los Angeles, the fire burning from the rear towards the front of the fire box.

Feed Water Supply.

The feed water is supplied directly from the city mains and from a well near the fuel tanks, about one-half of the make-up water being taken from the well. The feed water is passed through Cochrane heaters and brought up to a temperature of 180 degrees F. before entering the boilers. While the water is not hard on the boilers it is treated with tri-sodium phosphate before going into the boilers.

The feed pump equipment consists of two marine type duplex pumps; one a horizontal, duplex outside packed Scranton type Worthington pump, and the other a vertical marine type fire and general service pump which can be used as a feed water pump, or if necessary as a fire auxiliary. There is also a 5 in. turbine driven pump consisting of Kerr steam turbine direct connected to a Janesville Iron Works four-stage centrifugal pump. This pump has a capacity of 700 gallons per minute against a boiler pressure of 250 lb. per sq. in. It has been found that these centrifugal turbine driven pumps have a higher efficiency than the duplex reciprocating pumps, the efficiency being approximately equal to that of a single cylinder, non-condensing engine. These four feed pumps take water directly from the heater and are controlled by butterfly throttle valves in the steam pipes which are, in turn, controlled by the water level in the heaters.

The boilers lead directly into steel headers and from there piping leads out to the various turbines. Solid drawn steel piping is used throughout, expansion being provided by loops. The piping used in the plant was manufactured by the Best Company of Pittsburg.

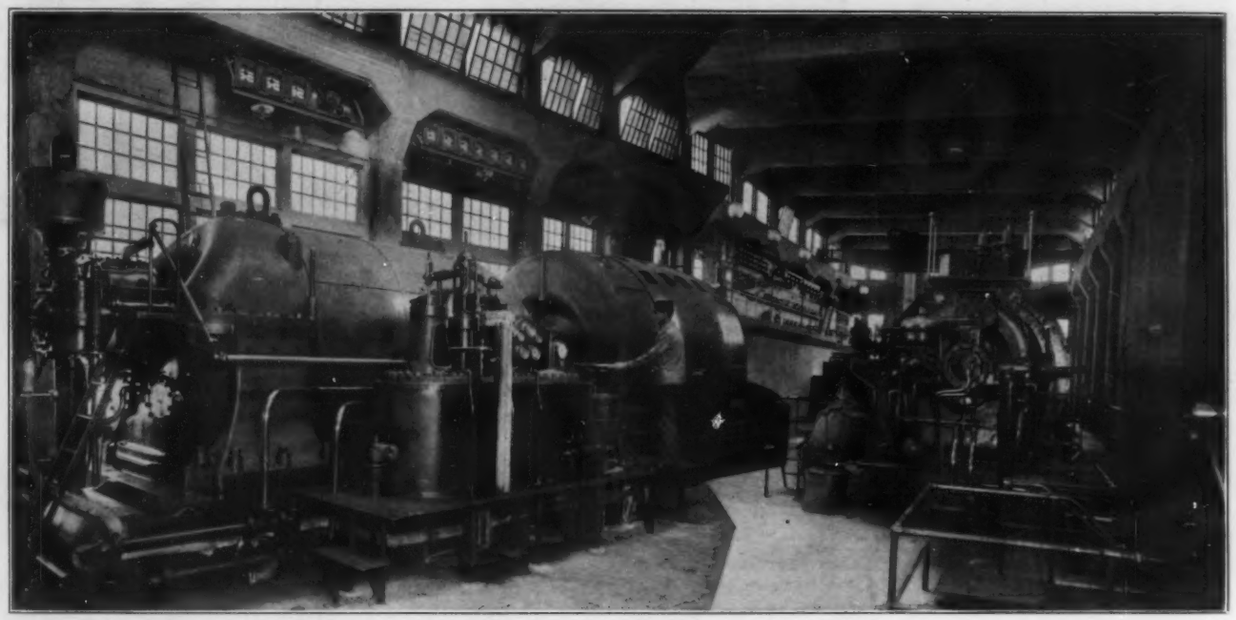
The original plant was designed and erected by Chas. C. Moore & Co., engineers, of San Francisco, who also furnished the boilers, pumps, piping and auxiliary apparatus for the additional units.

Turbine Room.

The main generating units are two 3000 k.v.a., one 9000 k.v.a., and one 15,000 k.v.a. Westinghouse-Parsons horizontal turbo-generators. All of these units were installed by Hunt, Mirk & Co., Inc.

The first two units were installed in August, 1907, and are of the parallel flow reaction type. Their characteristics are: 3000 k.v.a., 60 cycle, 11,000 volts, 1200 r.p.m., three phase, four-wire, grounded neutral, the turbine operating on a steam pressure of 175 lb. per sq. in. at the throttle, 28 in. vacuum. The steam is super-heated to approximately 45 degrees F.

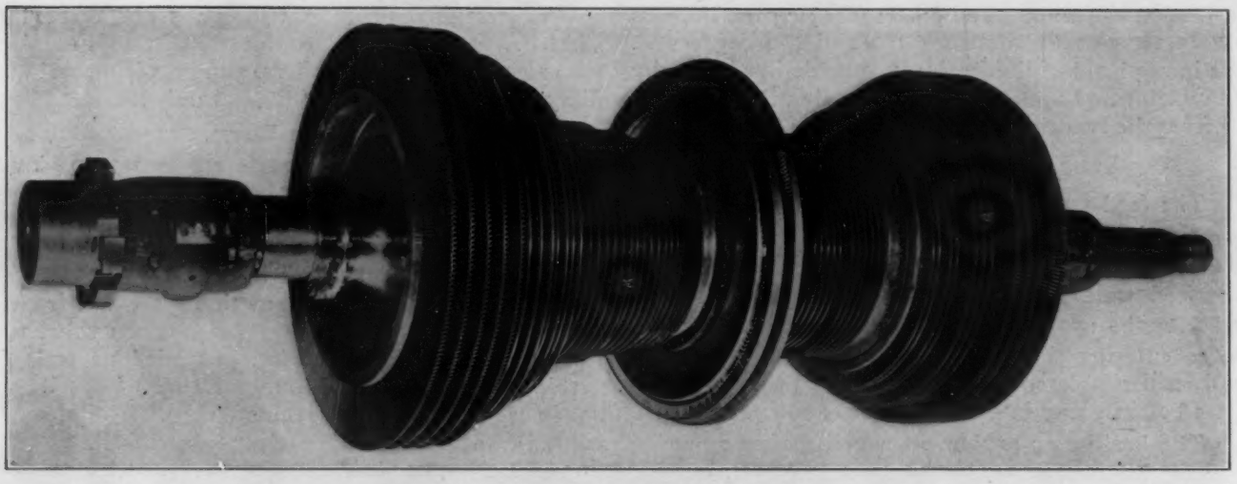
The second unit installed was a 9000 k.v.a. Westinghouse single double flow turbine with the same characteristics on the generator end as in the 3000 k.v.a. units. The only difference in construction appears in the turbine end, where the steam enters in the center and expands first through an impulse element, known as the high pressure cylinder; it then passes through the intermediate section of blades at the end of which section the steam is divided, part going through the spindle body, supplying the low pressure blading at one end, while the remaining part goes directly on through the low pressure blading at the other end.



Turbo-Generators

The last unit installed is one of the largest single steam turbine units in the United States, being rated at 15,000 k.v.a.. It possesses some marked improvements in design, more particularly in the high rotative speed ratings employed, namely, 1800 r.p.m., which is a distinct advance for units of this capacity.

The value of high speeds for obtaining the best ecomomies with turbines has always been recognized, while the feasibility of operating at high speeds has been viewed with uncertainty by those interested in



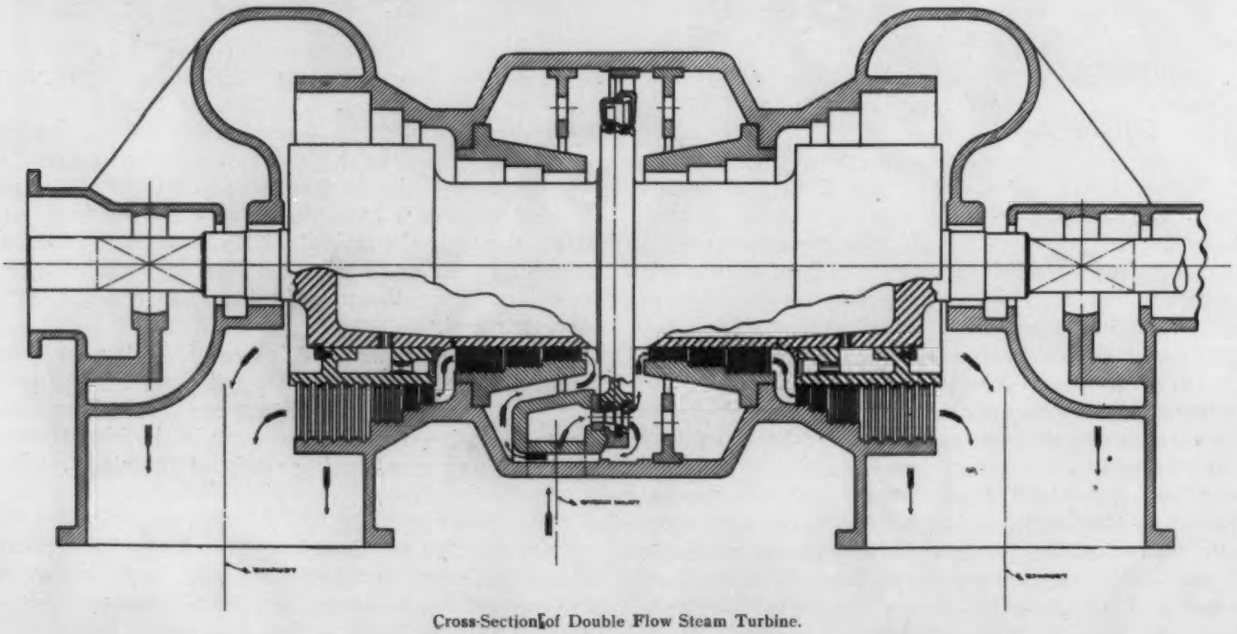
Rotor of Westinghouse-Parsons Turbine

turbines, except the designer. It has been with the characteristic double-flow turbine that the use of increased speeds has been made practical. A typical section of the machine installed shows that the steam entering at the center flows in two directions, as the name implies. Hence, with the steam thus divided, the necessary steam passage at the low pressure ends is accordingly reduced. It is evident that the same peripheral speed may obtain in case of either the high or the low rotative speeds. Generally where the peripheral speeds are made to correspond in any two types, the centrifugal stresses should not differ. But the smaller rotor of the higher rotative speed, containing less mass, may be cast or made of greater integrity, and there will invariably exist a higher factor of safety in high rotative speed units.

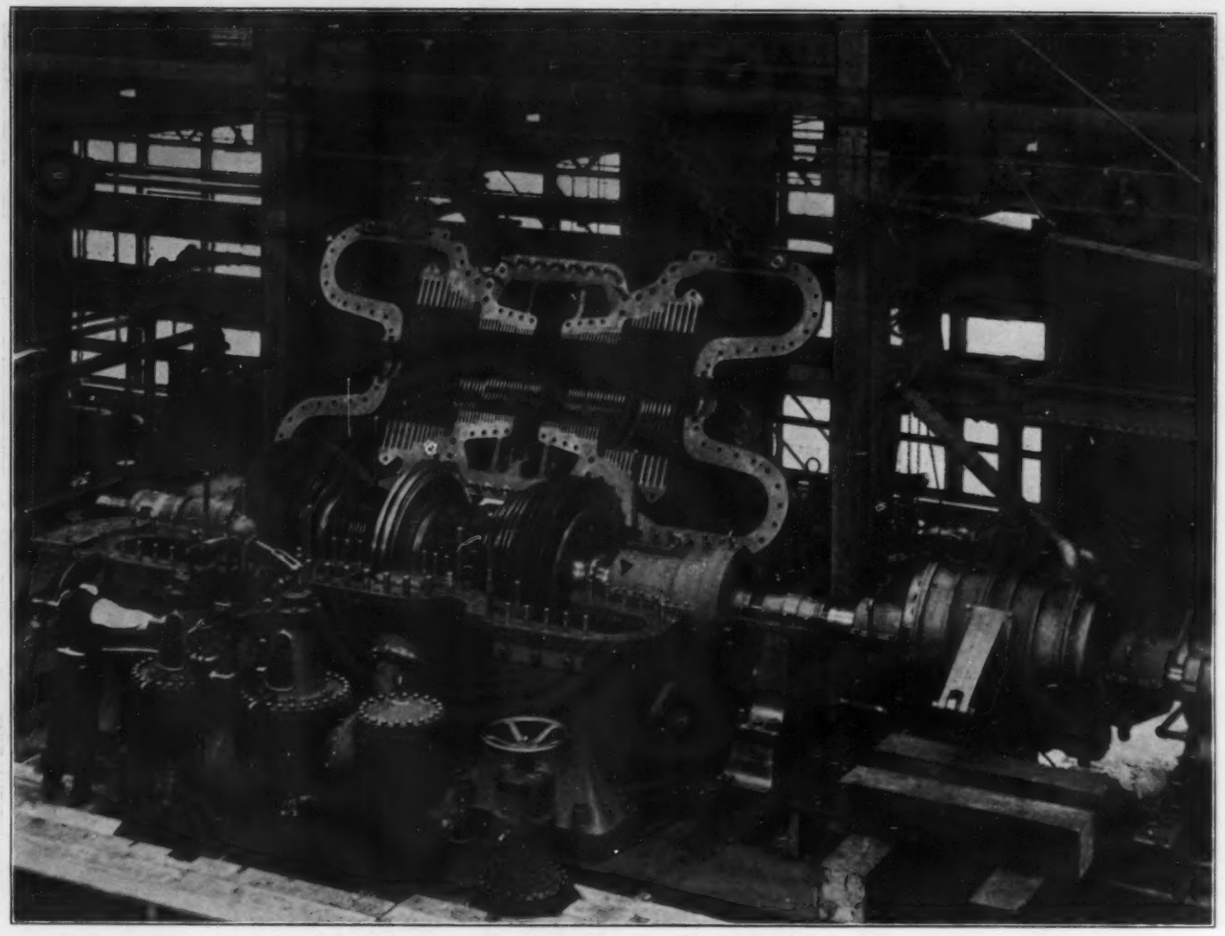
An impulse wheel is used at the high pressure end. Both intermediate and low pressure stages are double-flow, dispensing with the dummy pistons occurring in single reaction turbines to balance the axial thrust. Steam after being directed upon the impulse section by the expanding nozzles provided, divides, part expending its energy in passing through the right element and the remaining half being diverted to the left through the steam path circumventing the impulse wheel.

The symmetry of structure necessary for large capacities in order to avoid disproportionate exhaust ports or widely varying sectional dimensions, which would produce unwieldly and cumbersome castings has been amply fulfilled in this design. A rotor view accompanies. Similarly, the cylinder presents a corresponding appearance. These facts are emphasized strikingly in the illustration of a shop view of the unit after it has been tested at the builder's works and opened up for inspection before shipment.

The redistribution of steam and the ability to utilize more efficient blade proportions in the high rotative speed designs, has manifestly secured the very highest performance results. Recent demonstration tests have confirmed the value of these particular features of the design, and a thermodynamic efficiency of 69 per cent at the generator terminals was obtained, which excells any other steam motor record known. The principle data of the test will be published shortly in these columns.



Cross-Section of Double Flow Steam Turbine.



City Electric Company's 15,000 k. v. a. Turbine in Westinghouse Shops.

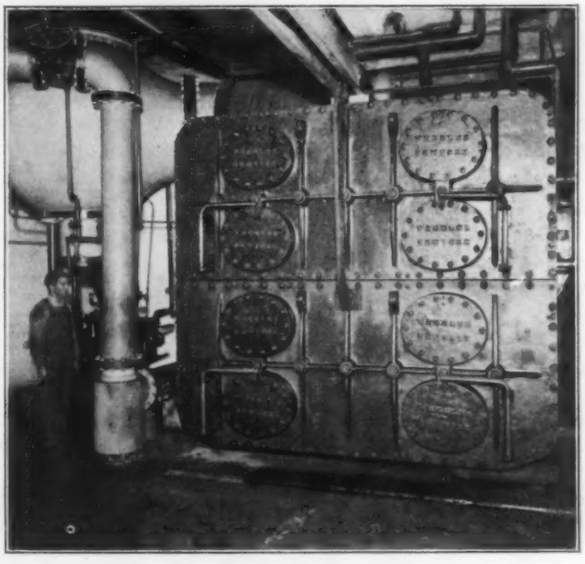
The machine is designed to operate normally at 175 lb. steam pressure, 100 degrees superheat and 28 in. vacuum. A four-pole rotor is employed in the 60-cycle three-phase generator coupled to the turbine. It is of steel casting made in halves and held securely by through bolts. The shaft ends are cast integral with each half of the rotor drum, which proves to be substantial construction for the high speed for which through shaft designs would not serve in large units.

The exciter for this machine is mounted upon a pedestal beyond the main bearing and is direct connected to the end of the generator shaft. It is a 75 kw. d.c. inter-pole generator of the same operating characteristics as the exciters for the other units. This latter feature permits all exciters being thrown on to the common bus-bars and makes possible their control by one Tirrell regulator.

The main turbine room is equipped with a 30-ton crane manufactured by the Cyclops Iron Works.

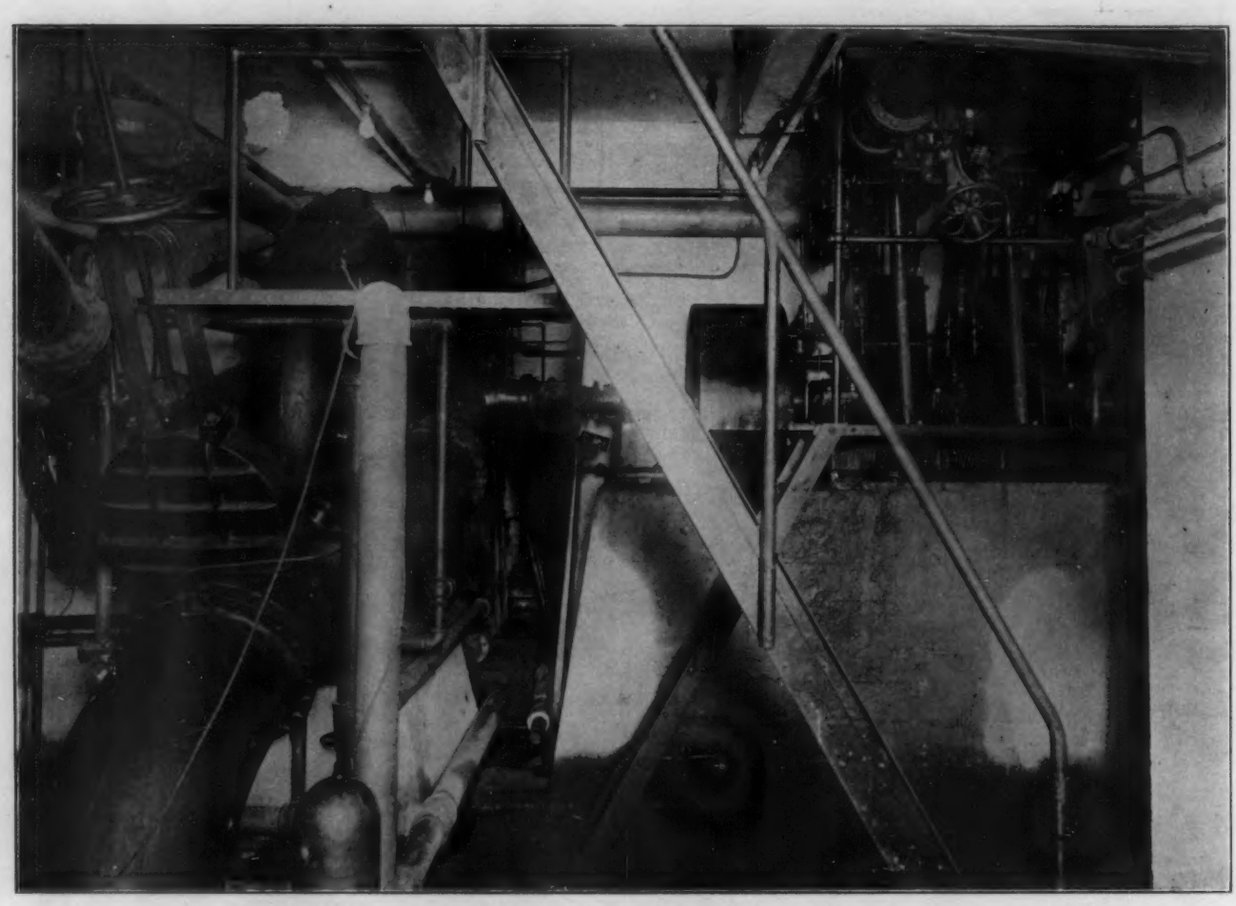
Condensers.

The vacuum of the turbines is maintained by Wheeler condensers. There are two condensers of 7500 sq. ft. area each; one of 18,000 sq. ft area, and one of 25,000 sq. ft. area. The circulating water for these condensers is taken from the waters of the San Francisco Bay, 550 ft. from the power house. It is brought in through a 42 in. pipe, which was installed below tide level and pitches toward the station. The circulating water for the two smaller condensers is supplied by a Kerr turbine, direct connected to a centrifugal pump. This turbine has a rating of 150 brake h.p. at 750 r. p. m. The pump has a 20 in. discharge pipe and a 24 in. suction pipe.



Condensers

For the intermediate condenser, the circulating water is supplied by a pump which is direct connected to a vertical double acting Lawrence Machine Works



Centrifugal Salt Water Circulating Pump and Engines with Chapman Gate Valve in Suction Line.

engine. The pump has a 30 in. suction and 24 in. discharge. The engine is 11 x10 in., single expansion, two cylinders.

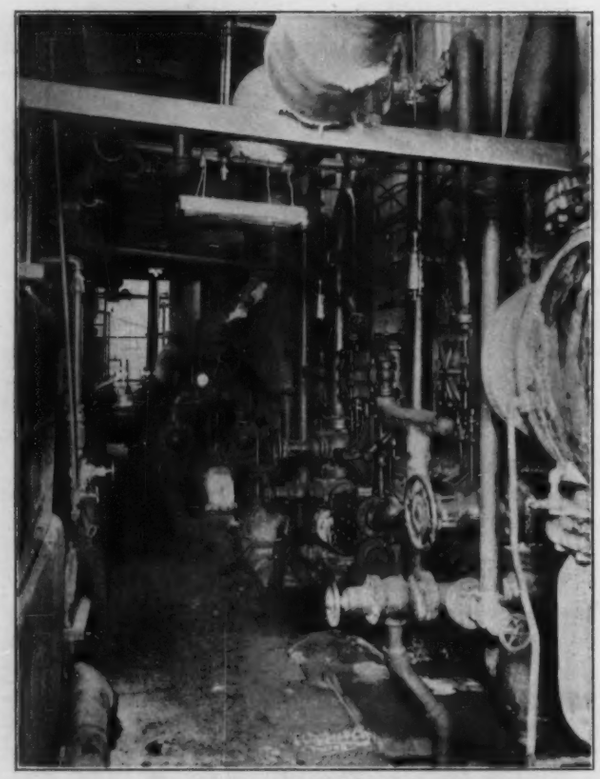
For the large condenser, the circulating water is provided by a Harrisburg Foundry & Machine Works 15 x17 in. piston engine, operating at from 175 to 250 r.p.m. and direct connected to a centrifugal pump. This pump has a 36 in. suction by 30 in. discharge pipe.

The condensers are so situated that their center lines in each instance are perpendicular to the center lines of the turbines to which they are connected, and they are placed in the basement directly under their respective turbines.

The exhaust from all of these pumps and pumping engines is condensed in the fuel and feed water heaters. The condensers operate on the wet and dry system, there being an independent dry air pump for each condenser, as well as independent hot well pumps. These latter pumps are all reciprocating with the exception of the hot well pump, which takes care of the large condenser. These pumps are all manufactured by the Wheeler company.

Exciters.

The excitation for the turbines is furnished by one 100 kw. horizontal, 2400 r.p.m. Curtis type d.c. turbo-generator; one Westinghouse 75 kw. motor generator set consisting of a type CCL, 100 hp., 690 r.p.m. motor, direct connected to a type "S" 75 kw. generator; the two machine being mounted on a common bed plate. On the



Alley Connecting Boiler and Turbine Rooms, Shower, Heaters, Pumps and Pipe Connections.

Switchboard.

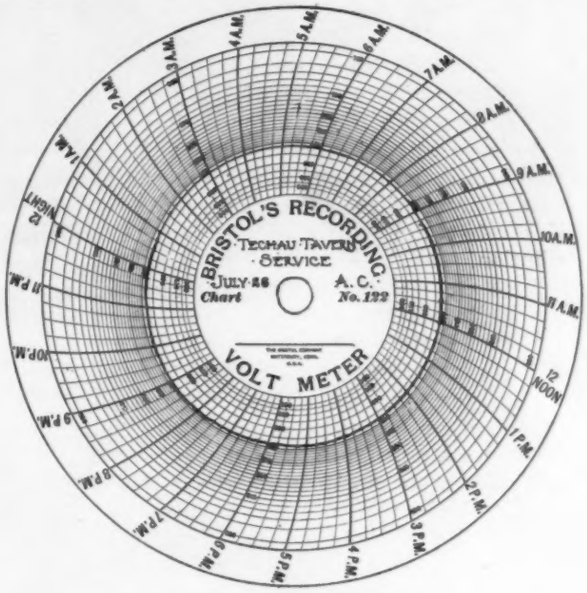
main frame of the large turbine there is a direct connected 75 k.w. Westinghouse, 1800 r.p.m. d.c. generator. The switchboard mounting is such that either of the first two mentioned exciters may be connected direct into any of the three above mentioned turbines, or all three exciters may be operated in parallel, exciting all four turbines at the same time.

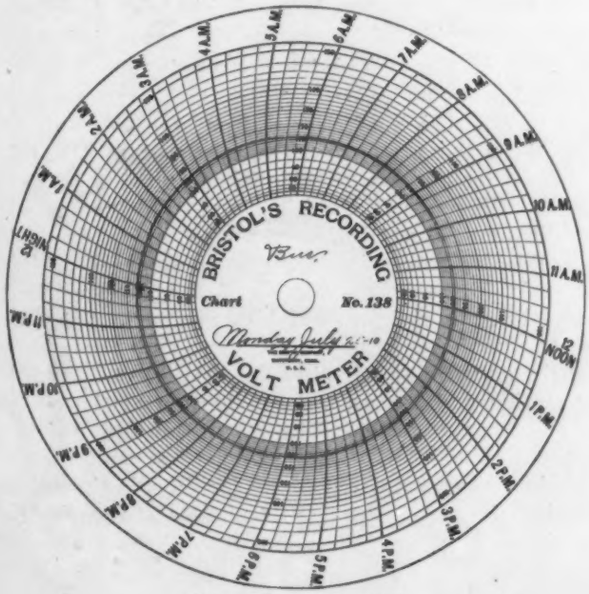
Switchboard.

The switchboard is mounted on an elevated gallery over the circuit-breaker compartments. It consists of seventeen panels, as follows: Four generator panels, three exciter panels, four three-phase feeder panels, and six single-phase panels operating double bus bars. All oil switches are in reinforced concrete compartments underneath the switchboard gallery. These are 15,000-volt, type "F," form K-4, 300-ampere, General Electric oil switches. These switches are manually operated but are provided with overload series relays of General Electric manufacture, type B-2 and type C-2. Generator panels Nos. 3 and 4 are provided with remote control 600 and 800-ampere switches. It is to be noted that the highest voltage on the switchboard gallery is 220 volts.

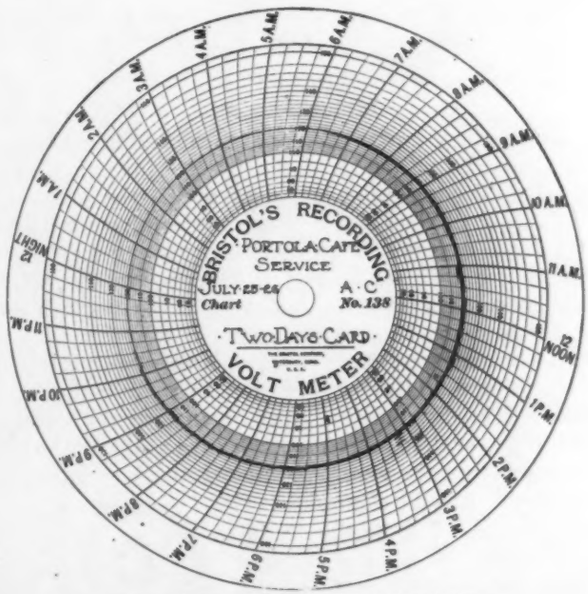
Regulators.

The regulation of the plant is controlled by a 7-point type "DA," form F-7 Tirrell regulator. The





Voltage Curve at Bus Bar.



Voltage Curves at Two Centers of Distribution.

accompanying reproduction of the curves of the voltage at the bus bars under normal operating conditions show that an exceedingly good regulation is obtained.

The outgoing feeders are controlled by six single-phase, automatic induction type regulators of General Electric manufacture, being designated as type I.R.S. These regulators are adjusted for constant potential at the centers of distribution. The accompanying Bristol charts indicate voltages taken from two prominent centers of distribution and show the remarkably constant voltage which is maintained even though the load is fluctuating considerably. These feeders are fed by the same buses that supply the railway load mentioned below.

Distribution System.

Leading out from the power house are two main circuits consisting of three No. 2 copper wires with a neutral of No. 1 copper. The distribution is at 11,000 volts, three-phase, four-wire, and runs overhead from the power house to Stockton and Bush streets and thence underground to the sub-station on Grant avenue between Sutter and Bush streets. There is also a similar circuit running via Chestnut, Laguna and Bush streets, through the Mission district out as far as Fifteenth and Harrison streets. This is a single circuit consisting of four wires of No. 1 copper. These lines, together with the interconnecting service lines, form a closed network, through which the service can be supplied in either direction. On these outgoing mains there are switches at each branching street from which single-phase feeders and the neutral run out for distribution.

There are also two circuits running between the United Railroads North Beach power house and the City Electric main power house, these circuits consisting of three 0000 copper each. There is no neutral run between these stations. These circuits supply the motor generator sets through which the United Railroads receive a portion of their energy.

At convenient points throughout the city, manholes and subway compartments are arranged in which are placed the manhole subway type transformers. These transformers reduce the voltage to 220 and 110 volts for customers' use.

The City Electric Company manufacture their own disconnecting oil switches and have developed a highly efficient and extremely simple type of switch.

Motor Service.

Two-phase motor service is furnished in nearly all cases, use being made of the Scott connection or a modified T connection, through which the company ingeniously obtains the proper quarter-phase voltage. This latter arrangement consists of placing an 11,000-volt to 220 and 110-volt transformer directly across the 11,000-volt mains, and a 6400 to 220-110volt transformer between the remaining main and the neutral. It will be observed that the secondaries are then of the same voltage and at right angles in their phase relations. By distributing such transformer stations around the system, using in each case a different main for connecting the neutral transformer, the whole system remains well balanced.

Sub-Station Switchboard.

The direct current distribution is from the company's sub-station at Bush and Grant avenue. This station consists of three 500-kw., 11,000-volt, three-phase, alternating current, 600 r.p.m. Westinghouse synchronous motors, each direct connected to two 250-kw., 250-volt, direct current generators. One generator of each set is of the three-wire type, thus giving the sub-station the advantage of distributing 120, 240, or 480 volts. These machines are each started with a 37½-h.p., two-phase, 220-volt induction motor, wound for a speed slightly higher than the operating speed of the set. This motor is direct connected to the end of the common shaft.

These machines are controlled by three direct current generator panels and three a.c. motor panels.

The direct current distribution is controlled by eleven feeder panels protected by General Elctric circuit breakers. The alternating distribution from the sub-station is controlled by nine single-phase feeder panels, and one three-phase feeder panel.

Local Distribution.

The direct current feeders consist of two 750,000 circular mil mains with one 500,000 circular mil neutral, in addition to several circuits consisting of two 500,000 circular mil mains with 300,000 circular mil neutral. The 110-volt cable is a 4/0, single conductor, lead-covered cable and is carried along with each feeder.

The general offices of the City Electric Company are on the main floor, directly over the sub-station at Bush and Grant avenue. The offices are conveniently arranged for the accommodation of customers and the transaction of the routine business of the organization. The same policy is in evidence in the office arrangements, which maintain throughout the entire organization, viz., that usefulness and a general high efficiency, is the criterion governing the operation of all departments.

HONGKONG WANTS WIRELESS.

In stating that great interest has lately been taken in Hongkong in the question of wireless telegraphy, Vice-Consul-General Stuart J. Fuller states that those interested in merchant shipping desire that a commercial wireless station be established in Hongkong, and the Chamber of Commerce and many influential residents in the colony have strongly urged it. A proposal was made last fall by an American company to establish a wireless station here to do a commercial business. They were prepared to put in a first-class installation, capable of communicating with Manila, Singapore, Shanghai and Yokohama, and though they did not believe that the station would be profitable for some time they were prepared to bear the early losses in consideration of a license giving them the sole right to conduct a commercial wireless telegraph business for 25 years, with the proviso that the government should have the right to purchase the station and business at a valuation at the end of 10, 15, 20 or 25 years. The propostion was referred to the Colonial Office in London, but was not accepted. At present there are no facilities in the colony for handling commercial messages by wireless, although the American, German and Japanese mail steamers calling at the port are being equipped with the apparatus.

PETROLEUM LUBRICATING OILS.[1]

BY PAUL W. PRUTZMAN.

In these days, when lubricating oils are practically all of mineral origin, we are first interested in the production of the crude oil. Petroleum is produced from holes drilled in the ground, in various places where oil is known or supposed to exist. In this country most drilling is done by means of the standard rig, which consists essentially of a string of tools, a cable, a walking-beam by means of which the tools are given an up-and-down motion, and a plain slide-valve engine of 25 to 30 h.p. connected to the walking beam by means of a crank with adjustable throw.

The string of tools consists of the bit, a sort of blunt chisel, with a width of face equal to the diameter of the hole to be drilled, length ranging from 5 to 10 ft., and weight running often into many hundreds of pounds. Above this the jars are attached by means of a coarse taper thread, usually ¼ in. U. S. S. and a taper of 1 to 4. The jars are a pair of slip shackles with an end play of about twelve inches, and at the upper end are screwed to the stem, which is a long steel bar used as a weight.

This drill is a churn drill, and pounds its way into the ground, being given a vertical reciprocating motion by the walking beam. On the down stroke the weight of the stem collapses the jars, and strikes the bit a hammer blow, while on the upstroke the stem jerks the bit free.

Manila rope is used for drilling shallow holes, and wire line for deep holes, the rope being attached to the tools by a rope socket, and at the upper end to the temper screw by a slip socket. The temper screw is a swivel screw for lowering the tools away from the beam—as the hole becomes deeper the tools are lowered to keep them on the bottom, and when the length of the screw (five feet) is run out, the beam is stopped, the socket slipped up on the rope, and the screw run back to its upper end. The reciprocating motion of the tools in drilling is from 3 to 5 ft., and the beam runs about 30 strokes per minute.

Water is kept in the hole at all times, and the drillings work up to a mud, which is removed from time to time by means of the bailer. This is a long tubular bucket with a flap valve in the bottom, which is lowered into the hole by a small wire line called a sand line. Reels and suitable bull-wheels, brakes, etc., are provided for raising and lowering the tools and bailer.

As soon as a small amount of hole is made, the casing is started into the hole, being screwed on at the top and lowered or forced down as the case may be. The first and largest string of casing is usually of light weight, and known as stove-pipe. The smaller sizes are either screw casing, about the weight of ordinary black pipe, or drive or line pipe, both considerably heavier. These pipes must have very perfect threads—some brands have taper threads like gas pipe, others have parallel threads and butt inside the collar. Each string of pipe is put down as far as it will go, or as far as safety permits, and then a smaller size is put inside, so that often a deep well is finished with four or five strings of pipe in it, each starting from the top of the hole, but only the smallest going to the bottom. The inside string is carried right through the oil sand and into the clay or shale below, and the last step is to punch this casing full of holes where it passes through the sand, so as to allow the oil to enter the casing. If the casing were left open at the bottom, not only the oil, but also a great deal of sand would enter, and the pump could not handle it, so the perforations are used as a strainer, to hold back the sand.

The oil which flows into the casing is pumped out through the tubing, a string of ordinary black pipe 2, 2½ or 3 in. in diameter, long enough to reach the oil level. At the bottom of this tubing is the pump, a plain working barrel with a ball valve at the bottom, and a similar valve in the plunger. This pump, of course, is single acting. The plunger is actuated by a string of ¾ or ⅞ in. steel rods, attached at the upper end to the walking beam. In pumping a much shorter stroke is used than in drilling, and the beam is run slower, being adjusted to keep the oil at some certain level in the casing. When anything goes wrong with the pump it is necessary to raise tubing and rods a stand at a time (a stand is the greatest length which can be handled in the derrick, usually three 20 ft. points), which are unscrewed and stood up in the derrick until all is out. Pulling the tubing and rods from a deep well is a heavy job.

A few wells flow naturally, but most must be pumped—in some fields many wells are pumped by means of air, in a manner similar to water pumping. The average production of wells in California was said, about a year ago, to be near thirty barrels per day, though I would consider this a little high. In some fields wells may be profitably pumped when they give as little as one barrel per day, but this is under the most favorable conditions. In some territory the minimum of profitable production runs as high as 100 barrels.

The oils of this state run all the way from 12 to 35 degrees in gravity, but most of the oil which is refined is 21 degrees or lighter. These oils give as products, gasoline (64 degrees), benzine (57 degrees), engine distillate (52 to 48 degrees), kerosene (42 to 41 degrees), stove oil (34 degrees), various lubricating oils and asphalt.

Distillation.

The first step in the actual manufacture of lubricating oils is the distillation of the crude. The still is a horizontal boiler, without tubes or other internal contrivances except a perforated pipe or series of pipes along the bottom, by means of which either wet or superheated steam is blown into the oil. The still is connected to a surface condenser, usually square coils of iron pipe, or often a battery of coils in parallel. The condensed vapors run through a sight box, a steel box with windows through which the stream of oil may be seen, and are distributed by a battery of valves to the various running tanks.

Distillation is by open fire in a plain firebox. The first distillate is the lightest, and the oil running from the condenser becomes heavier as more is taken off. The stock from which the lubricating oils are made is the last which is taken from the still, and is of about

[1]Address before Cal. No. 3, N. A. S. E. August 10, 1910.

20 degrees gravity, and of a green-red color. That is, it is green when viewed in a mass, but red when looked through in thin layers. The color when fresh from the still is much lighter, from straw to amber, but this darkens within a few hours. The residuum left in the still from distillation of crude is asphalt, the hardness of which will vary with the amount of distillate taken off.

Refining.

The lubricating stock is now pumped back to a clean still, and is again boiled and steamed until a proper amount is taken off. The distillate from this run is partly fuel oil, partly stock for very light lubricants, such as ice machine and neutral oil. The residue in the still, which is known as reduced stock, is thicker and heavier than the raw lubricating stock, and a little darker in color. Ordinary green oil or skid oil is an example of a reduced stock.

The gravity to which the stock is reduced depends on the kind of oil to be made, and the refiner's ideas as to treatment, but is always lower than the gravity of the finished oil, as the stock loses in both gravity and viscosity in the finishing treatment. The following oils are typical lubricating oils, and other varieties are but variants from these.

Ice machine oil and neutral oil are usually made by reducing the distillate from the first reduction of lubricating stock. An ice machine oil which is 23 degrees when finished will be reduced to say 21½ degrees, a neutral finished at 22 degrees will be reduced to 21 degrees.

Red oils (engine oils) and automobile cylinder oils are made from reduced lubricating stock. A red oil to be finished at 19 degrees will be reduced to 16 degrees, an auto oil to be finished at 20 degrees will be reduced to say 16 degrees. All the above oils are finished by an acid treatment and washing.

Cylinder oils are made from straight reduced stock either by acid treatment or by filtration. Filtration consists in passing the hot reduced stock through layers of freshly ignited bone charcoal. The coal takes out the impurities and the coloring matters—the first drops coming through the filter will be very pale, this color becoming darker and darker until finally the bone coal is exhausted, and the oil passes through unchanged. This method of finishing gives a pure and clean oil, but is difficult to apply to California oils. Filtration, in improving the color, greatly reduces the viscosity and the lubricating power.

In finishing by acid treatment, the reduced stock is pumped into steel tanks with conical bottoms, called agitators. These are provided with open end air pipes reaching to the bottom of the cone, by means of which the contents are agitated. Into the oil is poured a small amount of commercial sulfuric acid and the mixture agitated for some time. The acid becomes thick and black, absorbing several times its bulk from the oil, and in this state is known as acid tar or sludge. The sludge is allowed to settle out, and finally drawn off at the bottom, and burned or thrown away. This treatment with acid is repeated until the oil comes to the proper color, a point requiring some skill to determine, as the acid oil has not the color of a finished oil, but is a greenish-blue, sky-blue or even purple color when seen from above, and a dark red color in drops.

After all the acid possible has settled out and been drawn off, the alkali, a solution of caustic soda in water, is added and thoroughly mixed. The oil turns very sharply to a pale cloudy color, or even to a milk white. Great care is exercised at this point to get the mixture exactly neutral, as if it is left acid the oil will darken, while if it is made alkaline the excess of alkali is very difficult to wash out.

When neutralized, the oil is washed with warm water, either by adding water in small doses, mixing, settling and drawing off, or by spraying water over the top, and drawing it off as it accumulates at the bottom. The first water which comes through is milk white, and washing is continued until the water comes through perfectly clear. The oil then has its finished color, but is cloudy.

The last step is clearing out the cloud, which is done by keeping the oil warm in flat pans, and blowing air through it by perforated pipes. This air takes out the water cloud, and leaves the oil perfectly clear and bright, when it is ready for the market.

Acid treatment is essentially the same for all kinds of oil. Light oils lose about ten per cent of their volume to the acid, and one or two per cent to the alkali and water. Engine oils lose up to twenty-five or thirty per cent of their volume in treatment. This loss and the handling are the principal sources of expense, as the chemicals are not very expensive, but in the making of such oils as auto oil, which loses up to 40 per cent, the expense is considerable.

The color of the finished oil may be anything which the price will justify. The more acid used, the greater the loss and difficulty in handling, and the paler the color. The color, as has been often repeated, is of no importance whatever for most uses, but the market demands certain shades, and often pays heavily for them.

The principal difference between California lubricating oils and those of Pennsylvania is in weight—viscosities being equal our oils will be several degrees Beaume heavier than the Eastern oil. The flash point of our oils is also lower for the same gravity—these differences are due to basic differences in the raw materials, and cannot be much affected by refining methods. The reputation of California lubricating oils has also suffered from the difficulty of washing them entirely clean, which has led to a good deal of oil being put on the market with traces of soapy alkali products in it. These do not harm the lubricating properties, but cause the oil to emulsify and froth when rubbed up with water, and sometimes cause it to turn cloudy on standing. In the case of cylinder oils this is a very bad feature, and the production of a satisfactory cylinder oil from local stock has only been accomplished within the last two or three years. So far as other oils are concerned, while they have not the beautiful green color of the best eastern goods, they are in use fully equal to the best, and with the shrinkage in eastern supply, and the growth of our own fields, California lubricating oils have about absorbed the local market, and are rapidly becoming standard in the east.

SOME NOTES ON THE HISTORY OF PETROLEUM.

BY GORDON SURR.

Of the many interested in oil few give a thought to the history of the petroleum industry, yet natural hydrocarbons have been known and used from time immemorial. Gordon Surr, in the Mining World, recently abstracted the following notes, drawing freely upon W. S. Tower's "The Story of Oil."

The words rendered "pitch" in the Bible apparently refer to mineral pitch or bitumen, and we are given to understand that Noah coated his ark "within and without with pitch." In building the Tower of Babel, it is said "slime had they for mortar," but in some versions the words are translated "bitumen" in place of "slime," which throws light on the statement that "the vale of Siddim was full of slime pits."

Pieces of brick are found with a kind of asphalt mortar attached to them among the ruins of ancient Assyrian cities, while walls cemented with bitumen may still be seen in the ruins of the tower of Ackerouf, in old Chaldea, which was built at least 3500 years ago. Ancient bitumen and naphtha wells are said to have been discovered in many Assyrian localities, and bitumen is found to have been largely used as cement in building Babylon and Nineveh. The Egyptians used bitumens in embalming, probably 4000 years ago, for in many mummies the cavities are filled with asphaltic material, and petroleum is said to have been employed in the manufacture of the Egyptian papyrus.

The first account of the apparently more or less regular collection of petroleum was, however, written about 450 B. C. by the Greek historian, Herodotus, who says, "At Ardericca is a well that produces three different substances, for asphalt, salt, and oil are drawn up from it in the following manner. It is pumped up by means of a swipe and, instead of a bucket, half a wine skin is attached to it. Having dipped down with the swipe, a man draws it up, and pours the contents into a reservoir, and being poured from this into another it assumes these different forms; the asphalt and the salt immediately become solid, but the oil they collect; it is black, and emits a strong odor." Ardericca was in ancient Persia.

The Roman records are of particular interest owing to the references to wells in Sicily, from whence oil was obtained which was burned in lamps in the temple of Jupiter about the beginning of the Christian era. This is the first recorded instance of the use of petroleum for lighting, and Italian petroleum has been more or less used ever since as a source of light.

The inhabitants of the Hanover district in Germany are said to have used petroleum for ages, both for lighting and lubricating. They obtained their supplies from deep pits, called "grease holes," by dipping bundles of long reeds into the water, the adhering oil being removed by twisting the reeds together and thus wringing them out.

Although the petroleum wells in British Burma are considered by some as possibly the oldest in the world, the Baku district in Russia is far and away of chief interest in the ancient history of petroleum. Burning jets of natural gas are supposed to have existed for unknown ages in this region, and probably gave rise to the worship of fire. As Mr. Tower well says, "here in sight of the eternal flames, flickering above crannies in the rocks, lighted no one knows how, man, subdued with awe, came first to worship the mystery of fire. Here, for countless generations, hordes of Parsee worshippers came from Persia and far away India, from across the Caspian and the river Oxus, on pilgrimages to Baku, the holy city of fire, to their ancient stone temples and shrines, dedicated to the hidden power of flames that never ceased. Even until a generation ago, the famous temple of Surakhany welcomed its devotees from India, who still came to worship at the altars where the fires burned unquenched after thousands of years. Today pipes have been fitted to the crannies in the rocks; the gas is used by enterprising natives to warm their huts or cook their food, and profane oil derricks dot the surface. But in spite of all the dirt and ugliness in a modern oil region, the romance of history still hovers over the place where man perhaps first learned the nature of fire and bowed himself down in its worship."

The burning gas springs and fire worshippers are referred to in the early stories of Baku, but the use of petroleum itself is first directly mentioned by Marco Polo, who, visiting the region in the latter part of the 13th century, reported a great fountain of oil from which "a hundred shiploads might be taken at one time." He further remarks that the oil was good to burn, but not to eat, and was also used to cure diseased camels. Polo, though at times inclined to exaggerate, certainly spoke the truth when he stated that the oil was not good to eat, and, in later accounts, Baku is described as the source of oil which is "burned throughout all Persia." From springs in the Baku district, the Persians seem to have obtained oil in great abundance, which was used by all classes for fuel and light, and was, moreover, carried in bulk in sailing craft. Had the worthy Marco Polo been living a few years ago he could assuredly have seen another great fountain of oil for, in 1898, a single well in the Baku region yielded 3,500,000 bbls. of petroleum in 30 days, which means about 117,000 bbls. daily.

In short, bitumens and petroleum have been long employed for various purposes in many countries of the Old World and there is no doubt that petroleum was used medicinally by the American Indians before the coming of the French or English. The first mention on record of American petroleum, however, appears in a letter of a French missionary who, in 1627, saw a fountain of bitumen near Lake Ontario, and a "fountain of bitumen" is marked on a map, dating from 1650, in the vicinity of the present village of Cuba in New York State. During the latter part of the 18th century petroleum was used to some extent as a medicine by the whites, under the name of "Seneca Oil," but of so little account was it considered that, even in the earlier part of the 19th century, it was looked upon as a nuisance by the salt makers who cursed the oil that ruined their brine. These salt makers formerly dug wells from whence they obtained their brine, but later drilling tools were employed, and the first real drilled well west of the Alleghanies and possibly in the country, was bored about 100 years ago in the Kanawha valley, West Virginia. After this it became the general practice, in sinking these wells, to dig down to the bedrock and then to drill.

In 1826, a certain Dr. Hildreth published an article in which he prophetically stated, regarding petroleum, that "this product offers great resources as an illuminating agent, and will certainly become of great utility in lighting the future villages of Ohio," and, a few years later petroleum was used, where abundant, for lighting and lubricating, in place of sperm oil.

Some years before, Samuel Kier, a Pittsburg druggist, put up crude petroleum in small bottles bearing the following legend:

"Kier's Petroleum or Rock Oil, Celebrated for its wonderful curing power. A Natural Medicine Pumped from a well in Allegheny County, Pennsylvania, 400 feet below the surface of the ground."

Although by extensive and ingenious advertising, the sales were raised to as much as three barrels a day, the demand began to fall off and Kier found himself overstocked, whereupon he began to sell his medicine as lamp oil, but naturally the crude oil, with its abominable smell and smoke, was not much of a success as a household illuminant.

While Kier was trying to dispose of his oil as a cure-all, plants were being erected in various places for distilling illuminating oils from coal and shale, an industry which started in France about 1832. In 1846 Abraham Gesner, the famous engineer, made an illuminating oil from coal and introduced it into the United States, from Prince Edward Island, under the trade name of "Kerosene," and a few years later several plants in the United States were manufacturing these "coal oils." Possibly the success of these oils as illuminants suggested possibilities to Kier, but, at any rate, he tried refining crude petroleum about 1852, and after various experiments finally produced a distilled illuminating oil, which, though far from perfect, was a great improvement over crude petroleum. Oil, distilled from crude petroleum, is said to have been first used for lighting in Prague, Bohemia, in 1810, although Kier's was the first illuminating oil distilled from American petroleum, and Pittsburg the first place to use it. The first barrel of this refined oil was sold in New York at 70 cents a gallon, and at times prices reached $2 a gallon.

The consumption of Kier's "Carbon Oil" soon taxed the old salt wells to their utmost capacities, for not a single well had as yet been put down expressly for oil. In 1854, Jonathan Eveleth and George H. Bissell, New York lawyers, organized the first oil company in the United States, under the name of the Pennsylvania Rock Oil Company, "to raise, procure, manufacture and sell rock oil." The property of the company consisted of some 100 acres on "Watson's Flats," bordering Oil Creek, Pennsylvania. The company was later reorganized but it was soon plain that, to make a profit, larger quantities of oil would have to be obtained than what could be procured by skimming the water in pits and streams. Strangely enough, the suggestion for a solution of the problem was offered, it is said, by one of Kier's old cure-all circulars, which pictured the artesian well from whence he claimed to have secured his oil. Finally the company decided to drill a well on the Oil Creek property, and the work was put in charge of Elwin L. Drake, then a railroad conductor. Drake left for Oil Creek in 1858, and at the time of his departure his employers are said to have dignified him with the title of "Colonel," for business reasons, by which title he was thereafter known.

The plan was to dig down to the bed rock and then to drill but, in spite of every effort, the sand continually caved in and filled up the pit. At length, in 1859, Drake hit upon the ingenious device of driving an iron pipe down to the solid rock, and working the drilling tools through the pipe. At this time he succeeded in getting William Smith and his sons as drillman and helpers, who were men of long experience in sinking salt wells, including those from which Kier is said to have obtained his oil. After repeated attempts, the pipe was finally forced through the sand and loose material, when drilling was commenced with no more trouble from caving. Two or three feet a day was the best they could do in drilling, and having gone down about 69 ft. the men, returning to work on the morning of August 26, 1859, found the well nearly full of oil. Thus "Colonel" Drake and "Uncle Billy" Smith brought into being the first well ever drilled for oil in the United States, little dreaming of the present gigantic industry which has grown from this humble beginning. Truly it is not the part of wisdom to despise "the day of small things."

AMERICAN SOCIETY OF ENGINEER DRAFTSMEN.

On June 18th the first steps were taken to form a permanent organization to be known as the American Society of Engineer Draftsmen, embracing every branch of the profession, including mechanical, electrical, civil architectural, marine, sanitary, automobile and aeronautical draftsmen. The first meeting of the Society was held on July 27th. The formation of this organization, which was conceived by E. Farrington Chandler, a well known designer and inventor, marks the first effort to form a national society among draftsmen.

Draftsmen have long felt the need of an organization, both from an engineering and a fraternal standpoint, which would be the means to establish a higher professional standing and place them on a recognized professional plane, in the field of engineering.

The benefits of an organization of this character are well understood and need no elaboration. A decided feature of the Society is the opportunity offered Juniors, affording means by which they may become familiar with the demands of practice, in the drafting room, while students or employees in other branches of industrial work, as is also an employment bureau cooperating with employers.

The qualifications for membership are such, that a standard will be established, as in other branches of engineering, and it is the aim of the Society to maintain this standard, and to secure recognition from every concern employing draftsmen.

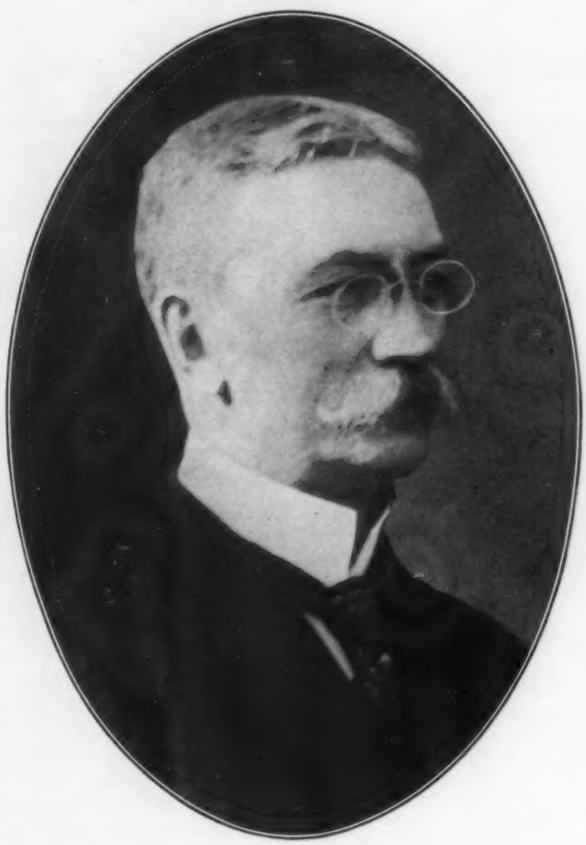
The officers chosen, are E. Farrington Chandler, president; Wm. B. Harsel, vice-president, and Henry L. Sloan, secretary and treasurer, with headquarters at 116 Nassau Street, New York.

ALEXANDER HENDERSON.

On Thursday, August 11, 1910, Alexander Henderson died at "The Anchorage," his home in the hills of New Hampshire, after an illness of several months; he was buried on Monday of this week.

"Alec" Henderson, as he was fondly known by thousands of friends in the electrical fraternity to whom he had endeared himself by his lovable nature, was prominently identified with the electrical trade for over a score of years, since 1906 having been associated with the American Circular Loom Company of Boston, Mass., remaining with them until the time of his death.

During some thirty-five years of business life, he traveled throughout the length and breadth of the land, always ably representing his employers and also drawing to himself the friendship of every man with whom he came in contact, until it became proverbial that all of his acquaintances where his friends.



Alexander Henderson

Of his many visits to the Pacific Coast perhaps the most memorable was that in January, 1908, when, as the guest of the electrical jobbers at Del Monte, he told of the hopes and aspirations to which he had steadfastly clung throughout the many buffetings of business life. His fondest dream, that during his declining years he might have a home "whose latch-string would not be hanging on the outside, because there would be no latch-string, but always a warm welcome to his friends," was finally realized when he bought a beautiful spot in the hills of New Hampshire and erected a modest cabin, which he called "The Anchorage" in memory of the feeling of perfect peace and contentment, which this term symbolizes to those that brave the seas, such an experience being an episode of his own boyhood life.

Mere words cannot do justice to the memory of this man, which has been perpetuated by the good deeds he accomplished. Of him it might truly he said that the world is better because he lived; in this respect he achieved the fullest measure of success.

His death is a personal loss to every member of the electrical fraternity. This is feelingly exemplified in the following letter from one of his dearest friends.

THE EDITOR:

"Friday last we were advised that our mutual friend, Alec Henderson, has gone across the Great Divide. Alec was one of my best friends. He no doubt, had the most extensive acquaintance of any man in the electrical business, a man beloved and respected by all. He had the peculiar quality of making fast friends on short acquaintance; this was because of his sterling qualities. Liberal to the limits of his purse, honest without regard to personal interest, always courteous and a man above men. Alec was a prince and all who knew him loved him.

"About a year ago, he wrote me in a vein unusual to him. It is difficult to say what prompted him; a man usually reticent about his own feelings, he gave expression to sentiments that showed the character of the man. I am taking the liberty of quoting one or two passages from the letter:

"*It cannot be more than a few years until some of your older friends cross the Divide and when my time comes to go, I sincerely hope that there will be but one feeling among my friends, that of great rejoicing that the struggle is over and, that at last I am free to explore new conditions of which we know so little.*"

That he esteemed his friends on the Coast is evidenced by the expressions in that letter:

"*I don't know how else to make you understand the great depth of appreciation in which I hold your friendship and the friendship of the 'boys' that stretch up and down and across the continent; yes and even beyond on both seas and that have helped me so much during all the years and that will give me strength and courage and endurance to the end.*"

The expression of affection which Alec gives utterance to, quoted above, is of such a character that all his friends should know of it. I, therefore, appreciate the opportunity to express, through the Journal, these lines in Alec's behalf.

Yours very truly,

T. E. BIBBINS.

DISCUSSION ON STEAM ENGINEERING PRACTICE.[1]

Rating Boilers on Thermal Efficiency.

W. P. Millner: How about rating boilers and engines on their thermal efficiency?

R. F. Chevalier: Rating by thermal efficiency is the correct method. A boiler rated at 100 h.p. is capable of developing 50 to 150 per cent more without injury. Builders rate boilers by square feet of heating surface. The capacity of a boiler depends upon the quantity of fuel capable of being burned beneath it. Where coal is used, grate area is an object. By increasing this grate area and with proper combustion boiler capacity is increased. There are several instances where fuel is burned from both ends of a boiler thereby doubling the capacity. The volume of the gases of combustion is considerably less with oil fuel than with coal. The temperature drop over the heating surface is greater due to rapid and complete combustion. The area of gas passages throughout the boiler may be decreased to great advantage and also a longer travel given to the gases. These conditions are favorable to higher efficiencies and greater capacity. More draft is required at the damper which increases the velocity at which the gases travel over the heating surface. A Babcock and Wilcox boiler fourteen tubes high and rated at 680 h.p., with superheater, showed an average temperature of 900 degrees F. at the top of the first pass. The gases traveling through the superheater dropped 150 degrees F., so that when entering the second pass over the boiler tubes the temperature was 750 degrees F. The temperature of the escaping gases at the damper were 550 degrees F. The furnace temperature was 2600 degrees F. About 37 per cent of the total heating surface of this boiler is in the first pass, where 83 per cent of the drop in temperature occurred. The superheater reduced the temperature of the gases 7 per cent and the remaining 63 per cent of heating surface reduced them another 10 per cent.

Baffling Boilers.

R. F. Chevalier: The question of baffling boilers has been given considerable thought where coal is used as fuel. Builders seem to persist in thinking that the same conditions should prevail where oil is used as fuel, at least very few attempts have been made to alter the arrangement of the baffles. Reducing the draft by adding baffles to decrease the cross sectional area of a pass where the gases turn usually results in greater efficiency. The same effect is obtained by partially closing the stack damper. In following this method the velocity of the gases is retarded and tend to increase the amount of inert gas surrounding the heating surface. Better results would be obtained by increasing the number of passes thereby decreasing the area of each and increasing the velocity of the gases over the heating surface and reducing the layer of inert gases.

Question: Would you narrow the first pass in proportion to the second?

R. F. Chevalier: Reducing the passes would depend upon existing conditions. With a draft at the damper of 0.25 in. of water, and .1 in. or less in the furnace it would not be advisable to change the baffles, as that would tend to reduce the capacity of the boiler. But if the draft at the damper and that in the furnace is high the best results would be obtained by a change in baffles. Moving baffles in a boiler that is already bricked in is expensive, the gain effected by such would have to be considerable to warrant the expense. A thorough investigation of conditions would be necessary before determining the area and number of passes that would be best suited.

L. W. Holbrook: Do gases contract or expand more as they go out?

R. F. Chevalier: As the gases move over the heating surface their temperature decrease and the volume is reduced accordingly.

J. G. De Remer: Does the velocity increase?

R. F. Chevalier: As the volume decreases, the velocity increases. This increase in velocity is also due to an increase of draft and a lessening of resistance to the flow of gas.

[1]California No. 3, N. A. S. E., July 20, 1910.

THE FACTORS OF INDUSTRY.

That capital and labor are the prime factors in the production of wealth was always a mistaken belief and is now an outworn doctrine, we are told by an editorial writer in Engineering (London, July 8). He admits both as factors, but ranks labor second and capital third. First of all he places enterprise, aided by experience and knowledge.

There is plenty of capital in the city, and plenty of labor walking the streets, yet they do not produce wealth. Enterprise, aided by experience and knowledge in the form of management, is required to utilize these forces—i.e., capital and labor. Labor is the second factor in production, and capital the third factor. It is essential, however, that management and labor should be highly skilled, for otherwise neither can profitably assist capital. . . . .

We have indicated that enterprise, experience and knowledge are the principal factors in wealth production. This applies to the manager in management, and to the workman at his machine. Modern economics demand this differentiation. Enterprise, knowledge and concentration are wealth productive, and especially so if confined within the sphere of activity in which experience has been gained. In other words, specialization is the key to profitable production. If these forces are to be utilized for the common good, they will require some form of organization, and a good organization requires good management. If these forces are not organized and managed, unemployment will be prevalent in labor and in the higher spheres of life. We perforce see that one of the greatest factors in production is management, and as the evolutionary process advances we recognize this more and more.

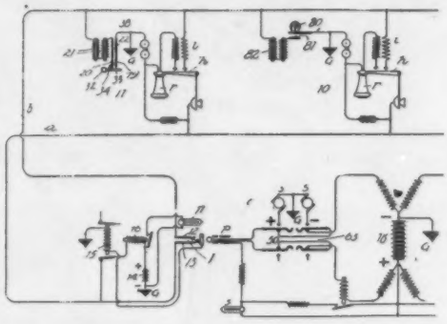
The large producer has many advantages which the smaller has not; he can afford to install new machinery built specially for cheapening production as it appears on the market. As already stated, what is new to-day is old to-morrow, and nowhere is this more true than in engineering. Cheap production is a boon to humanity, for it tends to bring luxury within the reach of all; cheap production in one sphere of activity stimulates further production in other spheres of activity, as it makes possible what in other circumstances might be impossible. As an illustration, let us take the case of a sewing machine. This is a necessity in most homes, more especially in poor ones. If the cost of producing these machines were high, only the better-class families could afford to buy them; but if the cost of production be low, every family may buy them; and so we come to see that one of the essential factors in human welfare is cheap production. It should be our main object in life, therefore, to bring about a general recognition of this principle; to see that the economic aspect of it is thoroughly understood by the workman himself. But it should be borne in mind that cheap production will not be brought about by cheap labor or by forcing labor to do more than it is physically capable of doing. Labor should have an adequate return for the services which it performs in production, and labor should not expect more.

We know that all men are not equal in ability, and can not be made so, but it is desirable that all men shall have equal opportunities. In the countries in which this principle finds the widest acceptance economic progress is the greatest. The enormous business activity in the United States of America is in a large measure due to this. One of the advantages of the free play of individuality is that by it the creative class of man—the man with ideas—is brought to the front. Men are divided into three classes—viz.: 1. The creative, the men of genius, the originators. 2. Those who manage for the first—the administrators. 3. Those who do the labor appointed by the first and second—the artizans.

Men of the first class will always be the real governors of the state. They are born not made, but economic conditions should be fostered that will favor their free development.

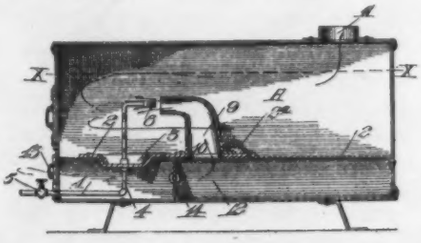
PATENTS

966,809. Electric Service-Meter. Oliver C. Dennis, Chicago, Ill., assignor, by mesne assignments, to Western Electric Company, Chicago, Ill. In a telephone metering system, a telephone line, talking apparatus associated with the line,



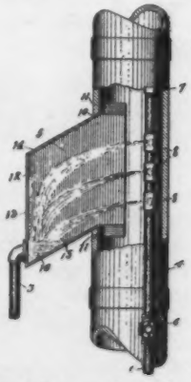
a register connected to the line, manual means for operating the register, and an electrical circuit independent of the talking apparatus for disconnecting the manual operating means of the register.

966,899. Oil-Burner. August J. Garloff, Stony Point, Cal. An oil burner comprising a base plate having a depressed pan, an oil conducting tube extending through the pan to a point above the same, and having the extended portion



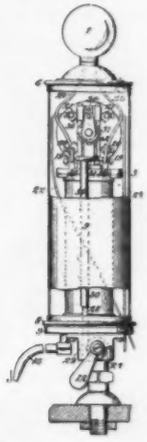
bent transversely to form a vertical series of coils, the terminal of the upper coil being bent horizontally in a plane at right angles to the coils, and having a burner fixed to its end, and an air-conduit extending upwardly from the base and having its discharge end separated from and presented horizontally toward the burner.

967,135. Smoke-Cleaner. Joseph Lachance, Morgan Hill, Cal. A smoke conduit in combination with a plurality of horizontally disposed parallel pipes extending through said



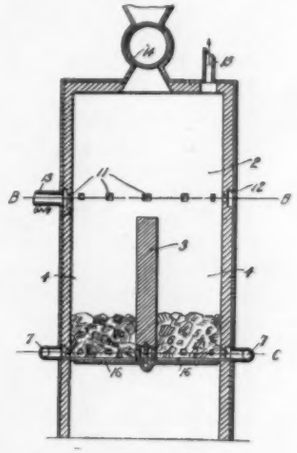
conduit one above the other and each provided with a longitudinally disposed slot extending substantially the width of the conduit and upon the same side of the pipes, said pipes being arranged at one side of said conduit, the side of said conduit opposite said pipes being provided with an aperture, a box fitting said aperture and having a closed bottom extending outwardly and downwardly therefrom, said aperture and said box being of greater height than the distance between the upper and lower pipes, and a drain pipe extending from the lower portion of said box.

967,058. Electric Water-Heater. Herbert N. Roche, San Francisco, Cal., assignor to Thomas B. Gray, San Francisco, Cal. In a water heater, the combination of a receiver, inlet and discharge connections thereto, an electric heating unit in



said receiver, a rotatable snap-switch, and means including a longitudinally movable member associated with the inlet connection, and a member engaged and rotated thereby and connectible to the switch.

966,718. Gas-Producer. Walter Thomas, Vancouver, British Columbia, Canada. In a device of the class described a casing, a grate within said casing dividing it into an upper and a lower portion, a partition in said upper portion dividing said upper portion into a pair of generating chambers,



said casing and said partition each having surrounding passages and twyers effecting communication between said passages and the interior of said generating chambers, valve controlled means for admitting air into said passages, valved controlled means for conducting gases from said passages, said passages for each of the generating chambers being separate and distinct, and means for admitting fuel through the top of said casing.

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE
Technical Publishing Company

E. B. STRONG, President
A. H. HALLORAN, Vice President and Managing Editor
C. L. CORY, Secretary.

DIRECTORS
R. J. DAVIS A. M. HUNT A. H. HALLORAN C. L. CORY E. B. STRONG

604 MISSION STREET, SAN FRANCISCO

EASTERN OFFICE, 150 NASSAU STREET, NEW YORK
C. N. MANFRED, Eastern Manager
LOS ANGELES OFFICE, 107 SECURITY BUILDING

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year,	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.10
Single Copies, prior to Current Month	"	.25

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas," Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

CONTENTS

Power System of the City Electric Co. 163
By J. G. De Remer and Chas. W. Baker.

Hongkong Wants Wireless 170

Petroleum Lubricating Oils 171
By Paul W. Prutzman.

Examination for Civil Engineer 172

Some Notes on the History of Petroleum 173

American Society of Engineer Draftsmen 174

Alexander Henderson 175

Discussion on Steam Engineering Practice 176
Rating Boilers on Thermal Efficiency.
Baffling Boilers.

The Factors of Industry 176

Patents 177
Electric Service Meter.
Oil Burner.
Smoke Cleaner.
Electric Water Heater.
Gas Producer.

Editorial 178
Preventing Accidents.

Personals 179

Meeting of N. W. Electric Light and Power Association .. 179

Industrial 180
Self-Propelled Machine Shop.
Speed Controllers.
Holophane Conference.
New Catalogues.
Feed Water Regulator.
Trade Notes.

News Notes 183

Preventing Accidents

The manifold savers of time and of labor that have been provided by our modern civilization are unfortunately not proving to be savers of life. Whereas the accidents that threatened primitive man could be counted on the fingers of his hands, we are now encompassed by dangers whose numbers exceed the hairs on our head. The advantage of the time economy effected by the electric railway is largely nullified by the growing list of trolley victims. Every branch of manufacturing, from the winning of the fuel and raw material to the marketing of the finished product, is accompanied by its life hazard. Exploding boilers, bursting flywheels, unguarded gears and unprotected electrical apparatus add their daily toll of death. No wonder the small boy differentiated "the quick and the dead" as those who do and those who do not get out of the way of the automobile.

The social responsibility of parent for child is far less binding than is the obligation of science for these agents which it has created. More than half the accidents to which we are heir are due to preventable causes, the remainder being inherent in the inevitable risks of certain employments. Statistics show that about half of the avoidable accidents are due to the worker's carelessness or lack of skill, the other half being caused directly or indirectly by the employer's negligence, especially in providing proper safety appliances. The inventor has already shifted a portion of his responsibility by furnishing devices which obviate many dangers and is now busily engaged in providing additional ones. Consequently it remains for employers to adopt these safeguards either through enforced legislation or from self-interest.

The last factor has already proven to be a powerful incentive, insomuch as it is cheaper to install safety appliances than to fight law suits and pay damage claims. Wider recognition of the employers' liability cannot but lessen industrial casualities.

The efforts of individuals to minimize accidents are now being supplemented by concerted action on the part of several organizations, particularly noteworthy being the newly established Bureau of Mines, the Museum of Safety and Sanitation established in New York City last year, and the National Association of Manufacturers, who have sent a committee abroad to study prevention and industrial relief methods in Europe. The result of their researches should be of great aid in lessening accidents.

But the fact still remains that the employee has a like responsibility. Many workers for whose benefit all these precautions are taken often oppose their introduction. A strike was recently called in one of the Pennsylvania coal mines because a helper was discharged for attempting to carry matches into a mine showing signs of gas accumulation. Many a boiler explosion has been traced to the engineers' carelessness in allowing scale to accumulate, just as bursting flywheels are frequently due to a blocked engine governor. Familiarity with danger often brings corresponding contempt among experienced workers who fail to exercise the ordinary precaution of the novice. It is impossible to make all machinery absolutely foolproof, and so Nature must continue to exercise her inexorable law of the survival of the fittest.

PERSONALS.

A. M. Hunt has returned to San Francisco after a business trip to Portland, Oregon.

F. F. Skeel, of Crouse, Hinds & Co., is in the Northwest, whence he will return East.

E. C. Johnson has been appointed chief engineer of the Los Angeles-Pacific Company, Los Angeles.

K. G. Dunn, electrical engineer with Hunt, Mirk & Co., has returned to San Francisco from an Idaho trip.

H. R. Noack, of Pierson, Roeding & Co., San Francisco, made a trip through Nevada during the past week.

H. A. Foster has opened an office as consulting electrical engineer at 521 San Fernando Building, Los Angeles.

F. T. Mumma, formerly with the Great Western Power Company, recently joined the engineering staff of Hunt, Mirk & Co.

B. C. Carroll, general agent of the Pacific Telephone & Telegraph Company, is making a tour of Northern California.

John Coffee Hays, general manager of the Mount Whitney Power Company of Visalia, arrived at San Francisco last Monday.

H. C. Keyes, secretary of the Sacramento Natural Gas Company, of Sacramento, Cal., was a San Francisco visitor last week.

R. S. Chapman, an electrical engineer with H. M. Byllesby & Co., of Chicago, is in San Francisco from the Pacific Northwest.

Guy C. Earl, chief counsel of the Great Western Power Company, has returned to San Francisco after a tour of four months through Europe.

H. V. Carter, president of the Pacific States Electric Co., returned to San Francisco from Los Angeles this week, being accompanied by his family.

J. B. Struble, one of the engineers of the Union Switch & Signal Company, which furnishes equipment for both electric and steam roads, arrived at San Francisco last week.

J. D. Ross, electrical engineer for the Seattle Municipal Light & Power Plant, has been transferred to the grade of Member in the American Institute of Electrical Engineers.

E. V. Eardley, formerly with the General Electric Company at Boston, has resigned to take a position as electrical engineer with the Knight Power Company, Salt Lake City, Utah.

Paul Shoup, assistant general manager of the Southern Pacific electric lines, spent the past week at Portland, Ore., in conference with R. S. Lovett, the president of the company.

Arnold Pfau, hydraulic engineer with the Allis-Chalmers Company, of Milwaukee, recently paid a visit to the company's San Francisco office after making a tour of the Northwest.

L. H. Baldwin, assistant manager of the Kellogg Switchboard & Supply Company's San Francisco office, is making an extensive business trip through Northern California and Southern Oregon.

John Harisberger, superintendent and electrical engineer of the Seattle-Tacoma Power Company, has been transferred to the grade of Member in the American Institute of Electrical Engineers.

R. W. Sorensen, formerly with the transformer engineering department of the General Electric Company, Pittsfield, is now associate professor of electrical engineering at Throop Polytechnic Institute, Pasadena, Cal.

Henry S. Carhart, formerly professor of physics at the University of Michigan, and now retired under the provisions of the Carnegie foundation, has returned to Ann Arbor after spending six months at Pasadena, Cal.

Wynn Meredith, Pacific Coast manager of Sanderson & Porter, of New York, will return to British Columbia on engineering business next Tuesday after spending two weeks at his San Francisco office.

Alfred E. Braddell has been transferred from the Chicago office of the Sprague Electric Company to the company's general offices in New York City where he will devote his time to special work in the conduit supply and sales department.

C. E. Maynard, auditor, and J. H. Hornung, commercial agent, for the Great Western Power Company, have returned from a trip through Southern California. They visited the Southern California Edison Company's hydro-electric plant in the Kern River Canyon, near Bakersfield, and the steam power plants of Los Angeles.

W. R. Alberger has been elected a director and a vice-president of the Oakland Traction Company, and will be the active head of the electric system at Oakland, Cal. Mr. Alberger will continue to perform his duties as traffic manager of the Tonopah & Tidewater Railroad, which is another of F. M. Smith's enterprises.

J. F. Adams has resigned as district commercial manager of the Pacific Telephone and Telegraph Company with offices in Reno, Nev., to become general manager of the Nevada-California-Oregon Telephone and Telegraph Company. The company has already constructed 145 miles of line and has offices at Reno, Plumas Junction, Amadee, Hot Springs and Doyle.

George B. Ellis, president of the Union Home Telephone Company, with headquarters at Los Angeles, has been spending a few days at San Francisco. His growing company has twelve exchanges in Southern California cities, including Riverside, San Bernardino and Long Beach, and interchanges business with the Home Telephone Company, of Los Angeles.

Newly elected Associates in the American Institute of Electrical Engineers include F. W. Brown, draughtsman, Pacific Gas & Electric Company, San Francisco; W. M. Fagan, purchasing agent, Pacific States Electric Company, 107 Security building, Los Angeles; O. M. Fisher, electrical engineer, Spokane; H. J. Flager, engineer, Eastern Montana Electric Railway, Red Lodge, Mont.; C. F. Forshund, power house foreman, Sierra & San Francisco Power Company, Vallecito, Cal.; C. K. Goodwin, electrical superintendent, West Side Lumber Company, Tuolumne, Cal.; L. J. Kraps, repair electrician, Sierra & San Francisco Power Company, Vallecito, Cal.; F. S. Lorentz, electrical engineer, construction department, Keating Gold Mining Company, Radersburg, Mont.; W. C. Miller, Jr., engineer of power stations, Southern Pacific Company, San Francisco; T. W. O'Reilly, Los Angeles; C. N. Rakestraw, assistant engineer Telluride Power Company, Provo, Utah; T. J. Royer, steam electric operator, Los Angeles Aqueduct, Aqueduct, Cal.; S. P. Skoog, electrician, California Wine Association, San Francisco; W. M. Stahl, plant department, Rocky Mountain Bell Telephone Company, Salt Lake City; E. F. Whitney, sales agent, General Electric Company, Seattle; C. A. Wolfrum, superintendent, Telluride Power Company, Grace, Idaho; C. Wortman, engineer, Home Telephone Company, San Francisco.

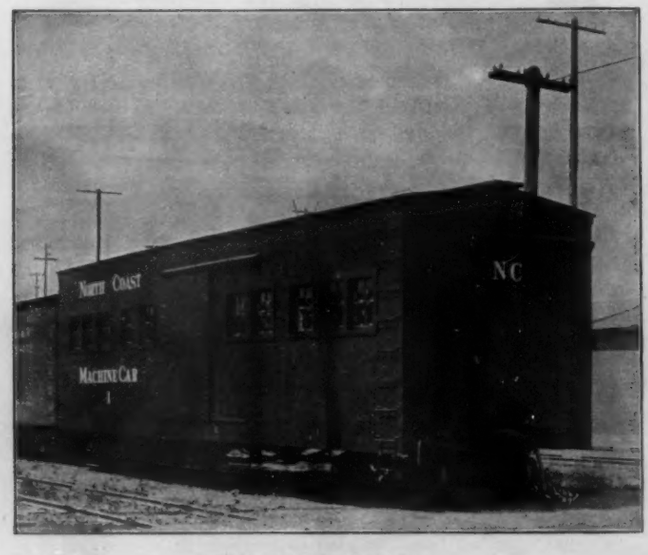
NORTHWEST ELECTRIC LIGHT AND POWER ASSOCIATION.

As herebefore mentioned, the annual convention of the Northwest Electric Light and Power Association will be held this year on the steamer Queen leaving Seattle the evening of August 26th and returning the morning of August 29th. Arrangements have been perfected for a number of excellent papers and all signs point to a most successful meeting. Arthur Gunn of Wenatchee, Wash., is president, and Norwood W. Brockett, Cataract Building, Seattle, Wash., secretary.

INDUSTRIAL

SELF-PROPELLED MACHINE SHOP.

The North Coast "Short Line" Railroad, of which Mr. Robert E. Strahorn is president, is still forcing its way through central and western Washington, from Spokane west to the rocky slope of the Cascades. The North Coast passes through the most fertile, irrigated valleys in the State, and will cross the Snake and Columbia rivers, the latter in two



North Coast Machine Car.

different places; the bridge at Burbank across the Columbia, costing $1,000,000. This line is the Walla Walla extension which will probably build east through the Blue Mountains and make connections with some eastern line.

The line now building from North Yakima to a point on the Columbia, in Walla Walla county, making connections

Interior of Machine Car.

with the O. R. & N., will be completed and in operation early this year for the fall trade.

The North Coast equipment is all new, and of the very best and latest designs, including two gasoline motor passenger cars, to handle the local business. The advance in mechanical appliances, which will be used in construction work, has been well planned.

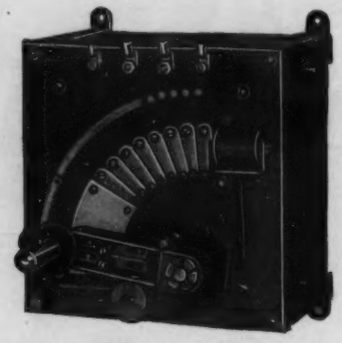
For repairing locomotives and other equipment, until such time as a permanent shop can be erected a machine car is being used. The interior view shows a 12 h.p. Fairbanks-Morse vertical gasoline engine, oil cooled, connected to friction clutch and to the wheels of the car by sprockets and chain, which enables the operator to do switching with the car and also move from one station to another, doing work without assistance of a locomotive, making eight or ten miles an hour. The tools in the car include one 23 in. engine lathe, one 16 in. shaper, one 1½ in. bolt cutter, one 6 in. pipe threading machine, emery wheel, and a 22 in. vertical drill. The dimensions of car inside 39 ft. 10 in. long, 9 ft. 6 in. wide and 9 ft. high.

The gasoline engine when running the shop 12¾ hours consumed 4 gallons of gasoline, with two men working in car on different tools as the work came in. The engine has been running nine months without one cent of repairs.

SPEED CONTROLLERS.

CR-164 speed controlling rheostats are so designed that they combine in a single box both armature and field regulating rheostats, and all speed changes are effected by movements of a single rheostat arm, which is automatically held in any position by a mechanical device. The line includes rheostats designed for machine tool service where full load current is taken at the lower speeds in order that the motors may maintain a constant torque, and also for fan service where the load increases with the speed. They permit of a 50 per cent reduction in speed by armature control and a 25 per cent increase by field control.

For protection from failure of voltage and the consequent danger of power being again thrown on the line without re-



CR-164 Speed-Controlling Rheostat.

sistance in series with the motor armature, they are provided with a no-voltage release attachment. Upon failure of the voltage, the retaining magnet is demagnetized, releasing the arm and a spring instantly returns it to the off position, making it absolutely impossible to close the armature circuit without cutting in all the armature controlling resistance. The no-voltage release coil is connected directly across the line in series with a resistance and is thus independent of the current of the motor field and will protect any motor with which this rheostat may be used.

The contact segments are of liberal size and so designed that they may be very easily and quickly renewed. The resistance units are of an improved design so constructed as to be non-fragile, and thoroughly ventilated.

CR-165 rheostats are the CR-164 rheostats described above with the addition of an overload release coil.

This device is manufactured by the General Electric Company, Schenectady, N. Y.

THE HOLOPHANE CONFERENCE.

The annual conference of the managers and engineers of the Holophane Company was held at Sagamore Island, Lake George, New York, July 10-17, inclusive. This convention is regularly called to discuss improved illumination and incidentally to promote the sale of the Holophane products.

F. H. Poss, the manager of the San Francisco office of the company, who has just returned from the convention, reports that it was a great success. Through his courtesy we are enabled to publish the accompanying illustration of the delegates and invited guests. The latter included Mr. Rockerfeller of the Western Electric Company, as the representative of the Eastern jobbers, William Low of the Electric Appliance Company as representative of the Central jobbers, and Andrew Carrigan of San Francisco as representative of the Western jobbers. Other guests included members of the National Electric Light Association and National Electric Lamp Association.

Members and Guests Attending Holophane Conference.

This year's conference brought up many points of vital interest. Within the past year, the field of industrial lighting has been entered and the need of correct, and scientific reflectors for mill, shop and factory illumination has been proven. While the Holophane Company was the first to enter this field, and while their product is today pre-eminent for industrial lighting, plans are already being laid for advance in this direction.

Residence lighting, also, has become a matter of great importance within the year, especially from the central station standpoint. In this field this company have already been working for many months and within sixty days will announce a new line of artistic reflectors especially designed for residence lighting service.

The Holophane Company's policy has been one of service, which it is the purpose of their annual conference to improve wherever possible.

NEW CATALOGUES.

"Hot Points" for August 1910 from the Pacific Electric Heating Co. tells of the return of the "bill-raisers" and also gives notice of improvements in their electric toaster.

The General Electric Company has recently issued Bulletin No. 4760, illustrating and describing a line of direct current instruments constructed upon the D'Arsonval principle and designed for switchboard use. The bulletin illustrations comprise external and internal views of the instruments, showing the details of construction together with dimension diagrams of the instruments and the shunts, and the scales used for different capacities are also shown.

The General Electric Company has recently issued Bulletin No. 4718, illustrating and describing all of the apparatus required for a complete series incandescent lighting system. The illustrations include Mazda lamps for street lighting with various forms of reflectors and suspension insulators, street system brackets, constant current transformers, panel boards, socket cutouts and ornamental poles, as well as complete dimension and connection diagram and illumination curves.

The General Electric Company has recently issued Bulletin No. 4750, describing standard couplings which have been found by experience to fill all requirements, and are adapted for coupling electrical apparatus together, or to other machinery. The types described are the leather link flexible laced belt, rubber buffer and flange coupling. All of these will run equally well in either direction. The bulletin is fully illustrated and contains dimension diagrams of the various types.

Bulletins Nos. 21-27 inclusive, from The Fairmount Electric & Mfg. Co., of Philadelphia, illustrate and describe new electrical specialties manufactured by this company. These include a station pot-heat for lead-covered cables which eliminates the wiped joint and is practically indestructible, "Arclets," a new form of hickey for hanging arc lights or clusters on tubing, "Bendhicks," a short ell bend-proof conduit fitting, "Emery" adjustable and separable tripods for straight electric fixtures, "All-in-one" ground clamps, "Vogel" ground clamps and "Alligator" test connectors.

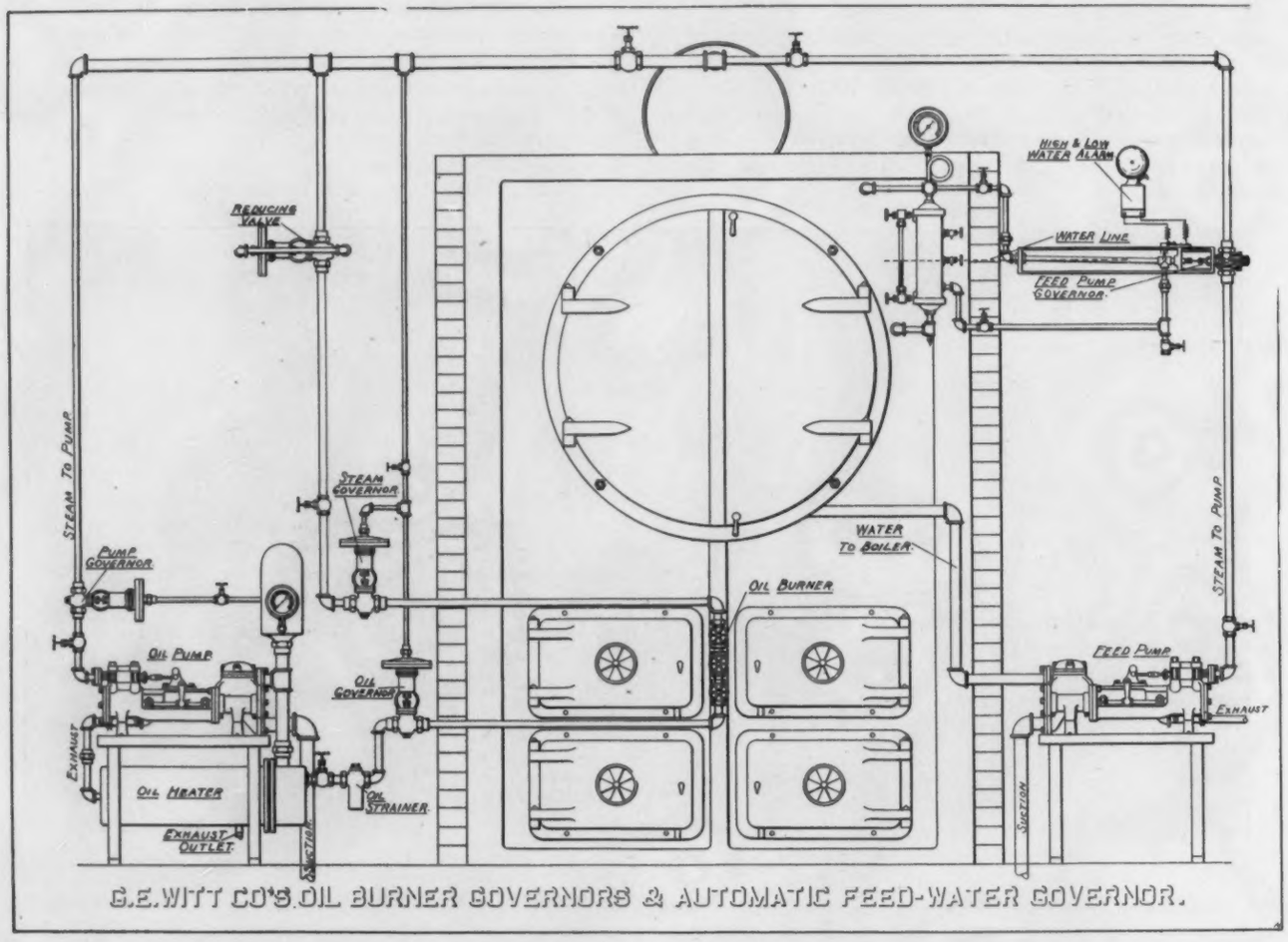
The General Electric Company has recently issued Bulletin No. 4752, illustrating and describing rectifier sets, luminous arc lamps and all necessary auxiliary apparatus for complete series luminous arc rectifier systems. The bulletin is fully illustrated and shows views of the exterior and the mechanism of the luminous arc lamp, as well as the series vertical carbon flame arc lamp for operation in series with luminous arc lamps. Luminometer chart, illumination curves and wiring diagrams are also shown, together with standard panel boards designed for this class of work. A complete set of dimension diagrams of the various apparatus and a partial list of actual installations are also included.

WITT AUTOMATIC FEED WATER REGULATOR AND OIL BURNER GOVERNORS.

The accompanying illustration and text of the G. E. Witt Company's automatic oil burner governors and boiler feed water regulator, is herewith reprinted from the Journal of July 23, 1910, to correct typographical errors that changed the meaning of vital details. The most essential thing in the operation of a steam boiler is the close regulation of the feed water and constant steam pressure, which is almost impossible to accomplish by hand regulation. The advantages of automatic regulation include a great saving of fuel and labor, increase in capacity of the plant and fewer repairs on the furnace and boiler.

This boiler feed regulator is operated by expansion and contraction. This device is simple in construction, has but one wearing part and is entirely external to the boiler, the expansion member consisting of a brass tube placed in a frame and located on a level with the desired water level in the boiler, one end of the tube being connected to the top of water column and the other end to the lower part of water column. As the water rises in the boiler it also rises in the tube, causing it to contract. This closes the valve and slows down the boiler feed pump which causes the water to recede in the boiler and tube until the steam enters the tube, which causes the same to expand and open the valve to the feed pump. The brass tube in this regulator being placed on a level, it requires but slight movement of the water to operate the valve. This feature insures a close regulation of the water.

The automatic oil burner regulation consists of two governors and one reducing valve, a reducing valve and one governor being placed on the steam pipe to the burner and one governor on the oil pipe leading to the burner. The oil and steam governors are set at the desired boiler pressure, the diaphragm being connected to the drum or main steam pipe of the boiler. As the load increases on the boiler, the steam pressure will decrease, thus causing the governors to open and increase the flow of oil and steam to the burner. Should the load decrease, the boiler pressure will rise, causing the governors to close the flow of oil and steam to the burner. The reducing valve is used in order to get a reduced pressure which is more ecoomical and noiseless.



G.E.WITT CO'S.OIL BURNER GOVERNORS & AUTOMATIC FEED-WATER GOVERNOR.

TRADE NOTES.

E. H. Hefferman has succeeded J. F. Adams, resigned, as district commercial manager of the Pacific Telephone and Telegraph Company at Reno, Nev.

The General Electric Company is building for the Montreal sub-station of the Canadian Light & Power Company, (J. G. White & Co., Engrs.), a switchboard consisting of a high and low tension switching apparatus. The current will be received at 48,000 volts, stepping down to 13,200. The capacity of the sub-station when put in operation will be 16,000 kw. with a steam auxiliary of 4000 kw. The ultimate capacity is 48,000 kw. with a steam auxiliary of 8000 kw.

The new hydro-electric plant of the Oregon Iron and Steel Company at Oswego, Ore., consisting of a 900-h.p. Pelton-Francis turbine direct connected to a Westinghouse generator, is completed and ready for operation. The plant, which was installed by the Pacific Electric Engineering Company, of Portland, will be used to furnish power for the cement mill now under construction by the steel company. S. G. Gorbett is the engineer in charge of construction of the cement plant.

NEWS NOTES

INCORPORATIONS.

EUGENE, ORE.—The Rogue River Valley Gas Company has been incorporated for $300,000 by J. R. Anderson.

ABERDEEN, WASH.—The E. H. Smith Electric Company has been incorporated for $250,000 by Edward H. Smith and Will Lanning.

REDLANDS, CAL.—The Northbrae Water Company has been incorporated by H. P. D. Kingsbury, F. E. Hotchkiss, E. S. Graham, W. P. Burke and E. B. Meeker.

SACRAMENTO, CAL.—The South Sacramento Power Company has been incorporated by H. W. Conger, Fred Ferheart, Robert Lewis, F. L. Holland, A. L. Darrow, J. Goran, George J. Bryle, E. A. Nicolaus, E. L. Southworth and Joseph Shaw.

FINANCIAL.

JACKSONVILLE, ORE.—At the municipal election Jacksonville voted to issue $30,000 in bonds for the establishment of a gravity water system.

VALLEJO, CAL.—The ordinance calling for the raising of $90,000 for water system betterments and $75,000 for a new city hall and branch county jail has been passed by the Trustees.

FALLON, NEV.—The City Council has passed an ordinance authorizing the establishment, building and constructing a water works system for domestic use, manufacturing and fire protection for this city; to borrow the sum of $35,000 for the purpose and to issue and sell bonds of the city.

OGDEN, UTAH.—An election will be held in the City of Ogden, Utah, on September 6, 1910, for the purpose of submitting to vote the question of issuing and selling bonds in the amount of $100,000 for the purpose of constructing an additional conduit from the sources of water supply in the Ogden River system.

EUGENE, ORE.—Eugene's recent $60,000 bond issue for a filtration plant and for water main extension has been approved by the attorneys for Morris Bros., the Portland bond buyers, who were the successful bidders for the bonds, and they will at once be sold and the work of building the filter and of extending the mains will go ahead.

MODESTO, CAL.—The Board of Trustees met in adjourned session and after some discussion the ordinance, calling for a special election Tuesday, September 6th, for the purpose of voting on a bond issue of $100,000 for public improvements was introduced. For the acquisition, construction and completion of a sewers system, $65,000; for waterworks, $15,000; for the construction of street work, $10,000.

TRANSMISSION.

STEVENSON, WASH.—The Skamania Light & Power Company is preparing to extend its lines to Carson at once.

SAN FRANCISCO, CAL.—Steps are to be taken immediately to add 10,000 h.p to the capacity of the Great Western Power Company plant at Big Bend.

COQUILLE, ORE.—Fire recently destroyed the lighting plant of the Johnson Lumber Company's sawmill, causing a loss of $50,000. The plant furnished light for this place and Myrtle Point.

MYRTLE CREEK, ORE.—Negotiations have about been completed for the purchase of the plant of the Myrtle Creek Water, Light & Milling Co. by J. L. Blaisdell of Portland. The smaller plants will be eliminated and their places taken by transformer sub-stations, etc.

SAN ANDREAS, CAL.—Engineers have begun on the final plans and field work by the General Electric Power Company on power sites in Calaveras county, which control sufficient water to generate 60,000 h.p. Le Grand Brown, a consulting engineer from New York, is in charge of the present work.

SACRAMENTO, CAL.—The Great Western Power Company has contracted for nearly all the power that it originally estimated to produce. Up to date, contracts have been signed for about 50,000 h.p. along the route of delivery. Manager Hillborn, local representative of the company, says that immediate steps will be taken to add another unit to the 10,000 h.p., capacity of the plant.

ILLUMINATION.

LOS ANGELES, CAL.—The City Council has employed an engineer to give an estimate of cost of erecting a gas plant to supply the entire city.

OREGON CITY, ORE.—An ordinance has been passed authorizing the City Council of Oregon City, Oregon, to enter into a contract with the Portland Railway, Light and Power Company, to light Oregon City from the first day of September, 1910, to the first day of September, 1915.

SAN DIEGO, CAL.—The people of San Diego have decided against municipal ownership. At the election 19 out of 20 propositions submitted to the people were adopted and the 20th and last, a proposition to bond San Diego for a municipally owned and operated gas, electric and power plant, was defeated by a vote of five to one.

SPOKANE, WASH.—Spokane capital will build a water power electric plant at Three Forks, Gallatin county, Mont., to furnish water, electric light, power and heat. It is estimated that the plant will cost in the neighborhood of $200,000. Associated with a Spokane syndicate is said to be Senator Joseph M. Dixon of Montana.

ASHLAND, ORE.—The Council has passed an ordinance granting to J. R. Allen the right to lay down and construct, operate and maintain and use railway poles and wires, and underground conduits and conductors in the city of Ashland, Ore., to operate cars and locomotives other than steam, to generate and transmit power, and to send and receive messages by telegraph and telephone over certain streets in the city of Ashland, Oregon.

SAN FRANCISCO, CAL.—A petition for the dissolution of the Union Light & Power Company, which for the last five years has held franchises and power rights on the eastern slope of the Sierra Nevada Mountains, has been filed. Out of the 1,515,748 shares issued, 1,505,266 were represented at a company directors' meeting on July 6, which authorized the dissolution. Following are the officers and directors of the company: Charles H. Hammon, president; A. E. Boynton, secretary; A. L. Dahl, Ray Marrows, C. F. Mettier, H. C. Mack, H. S. Goodfellow, directors.

ALLEGHANY, CAL.—The sub-station of the Middle Yuba Hydro Electric Company is being constructed in Buckeye Diggings near Smith's Flat, and the agent of the company says he will be ready to deliver electricity throughout Alleghany by September 15. The company is reconstructing the road on the Lafayette ridge between the Croesus mill and the Plumbago mine in order to facilitate the transportation of material for the new plant in American Hill. It will be two years before the latter is completed. In the meantime the company will rent its power from the Pike City plant.

TRANSPORTATION.

GRANTS PASS, ORE.—It is reported that the Coos Bay Traction Corporation, with an authorized capital of $1,000,000 will construct a line from Coos Bay to Grants Pass with a branch to Roseburg.

POMONA, CAL.—The $5,500 required to purchase right of way from Claremont to Pomona for an electric railway has been raised and the road will be in operation December 1st. It will be the Pacific Electric Railroad Company's line.

SEATTLE, WASH.—It is announced that the Bainbridge Development Company will begin construction on its proposed trolley line on Bainbridge island about December 1. M. B. Jackson, Jr., 409 Bailey building, is president of the company.

LOS ANGELES, CAL.—The City Council yesterday authorized publication of notice of the sale of an electric street railway franchise along Evergreen avenue from Brooklyn avenue to Blanchard street and thence along Blanchard street to the easterly boundary of the city.

PORTERVILLE, CAL.—An official of the Holley railroad makes the statement that the Porterville- Coalinga Electric Railroad Company has $3,000,000 in cash available for the construction of a railroad from this city to tidewater. Preliminary surveys have been made of the road which has been planned to run from Porterville through Tulare, Hanford and Coalinga, with a branch from this city to run also through Lindsay, by way of Frazier valley, through Exeter and other small settlements to Visalia. Sites for power plants have already been secured on the Upper Tule river and it is proposed to equip the entire road electrically. The officials, which include J. J. Vossburg, orange grower of this city and Charles Eiester are among the incorporators of the road.

TELEPHONE AND TELEGRAPH.

NEZ PERCE, IDAHO.—The Nez Perce Telephone Company will build a line from Vollmer to Cottonwood.

KLAMATH FALLS, ORE.—The Council has passed an ordinance granting to the Pacific Telephone & Telegraph Company a franchise to conduct its business in this city for a period of 25 years.

SAN LUIS OBISPO, CAL.—Negotiations have been consummated whereby the two Home Telephone Companies located at Whittier and Downey have been added to the system of the Pacific Telephone Company.

YREKA, CAL.—A petition of the Cedar Park Rural Telephone Company for permission to erect and maintain a telephone line along the public highway in a northerly direction from Mayten for a distance of about 10 miles, etc., has been granted.

MANTON, CAL.—The Volta power house is putting in a wireless system to be used with the Redding, Shasta county, power office. This will be used mostly during the winter, when the wires of other systems are down during the heavy snowfalls.

SAN FRANCISCO, CAL.—The Santa Fe has ordered apparatus to equip 460 miles of its line with telephones for dispatching trains. The outside construction work is already under way and eventually all traffic and all train movements on the Santa Fe will be directed by telephone. At present 2275 miles of the line are so equipped.

SAN FRANCISCO, CAL.—The Western Union Telegraph Company, under Charles H. Gaunt, the new general superintendent of the Pacific Division, has leased the four upper floors of the five-story building at 250 Montgomery street adjoining the San Francisco main office. A great deal of additional office space will be occupied under the new three-column organization that is being inaugurated. Many improvements in the plant as well as office arrangements will be made in San Francisco, Seattle and elsewhere in the nine States of the Pacific Division. This is admitted to be one of the most important of the four sections into which the United States is divided by the company.

TRUCKEE, CAL.—George Walling, George Carter, Lawrence Carter and Marcellus Fischer of Nevada City are here to repair and rebuild telephone lines in this section. They will do the work for the Tahoe national forest, which is building a complete system hereabouts and when they finish, communication may be had with the ranger stations resorts.

PORTLAND, ORE.—The United Wireless Telephone Company has announced the discontinuance of its stations at Portland and St. Helens. This completes the elimination of the land offices of the company, which, in the Northwest at least, will hereafter confine itself to the stations along the coast. The station at Astoria, well situated for communication with vessels, will become a 24-hour station.

KLAMATH FALLS.—At the meeting of the City Council last week a 25-year franchise was granted to the Pacific Telephone & Telegraph Company. L. H. Newton, who is here looking after the interests of the company which took over the plant from the Midway Telephone Company recently, states that his company will have engineers in the field within a short time working out the plans for the proposed improvements.

WATERWORKS.

JOSEPH, OREGON.—J. M. Mitchell of Joseph will install the Joseph water system for $16,800. It is the intention to connect the large main with Wallowa Lake, a mile south, and above the town which will give ample force for all purposes.

SAN JOSE, CAL.—Judge Welch has denied the motion of the Bay Cities Water Company which is the defendant in an action brought by the Hayes-Chenoweth Company to restrain it from diverting the waters of Coyote Creek, so to amend its answer as to narrow the issue to its use of the surplus waters instead of the entire flow. The question of riparian rights involved was settled in a similar suit against the company a few years ago, when Superior Judge Rhodes decided against the company. This ruling was subsequently affirmed by the Supreme Court.

SAN FRANCISCO, CAL.—City Engineer Manson has filed a report embodying statements of interest in connection with the daily consumption of water. The average daily consumption for June, according to the report, was 38,100,000 gallons, a considerable increase from the 35,700,000 gallons representing the average consumption for the corresponding month last year. The maximum daily consumption during June of this year was 41,200,000 gallons, as against a corresponding maximum of 40,100,000 for June, 1909. The increase in the June daily consumption, the City Engineer notes, is the more worthy of attention in view of the fact that the month named was comparatively cool this year. The minimum daily consumption this year was 34,700,000, occurring in January last, the corresponding minimum for last year was 32,600,000 gallons. The report calls attention to the fact that there is every reason to anticipate a group of warm weeks during August, September and the early part of October during which the maximum daily consmption for June mentioned, much as it exceeds the average daily supply now available, 36,000,000 gallons, is likely to be still further exceeded. There is, in fact, he suggests, an evident minimum increase of 2,500,000 gallons daily provided for each year for several yet to come.